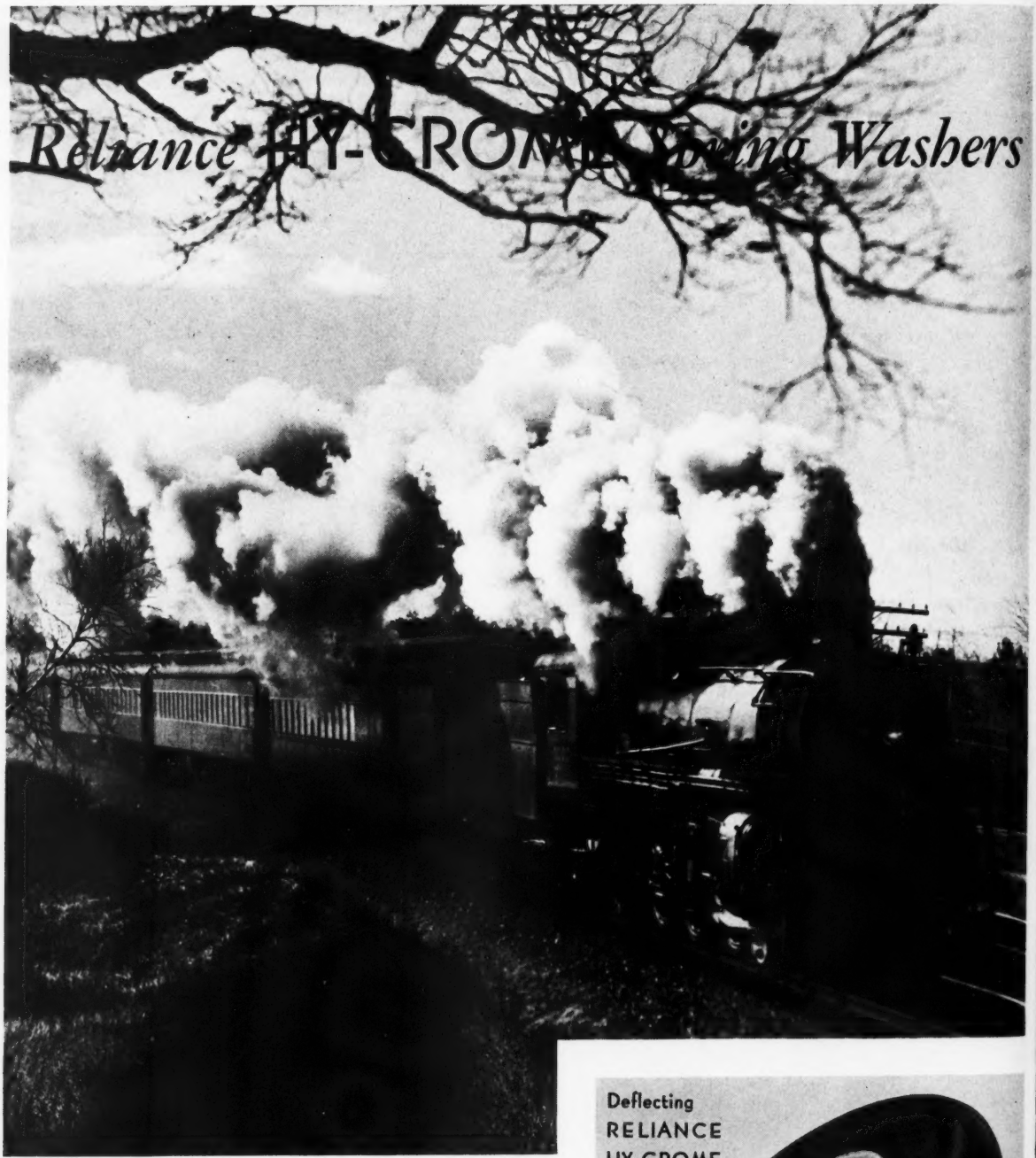
September, 1934

Railway Engineering Maintenance

THE RAIL JOINT COMPANY
30 BROADWAY NEW YORK, N.Y.



THE FLYING YANKEE ONE OF AMERICA'S FAMOUS TRAINS

TWICE daily THE FLYING YANKEE travels the 114.6 miles in 135 minutes between Boston and Portland, Maine—a daily dash through three states that ranks it as one of the very fastest passenger runs in the country. Here she is shown moving 65 miles per hour on the return trip to Boston. It is on track carrying the fastest traffic that greatest care must be given to maintenance, from selection of the most dependable track appliances to their application. And it is on the fastest tracks in the country that HY-CROME is in general use for maintaining rail joint integrity.

EATON MANUFACTURING COMPANY
RELIANCE SPRING WASHER DIVISION
MASSILLON, OHIO
Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal

Deflecting
RELIANCE
HY-CROME
Spring Washers
—Optional—

Deflecting and beveling prevents the scoring of Angle Bar and Nut in Backing Off Nuts

Patent Applied For

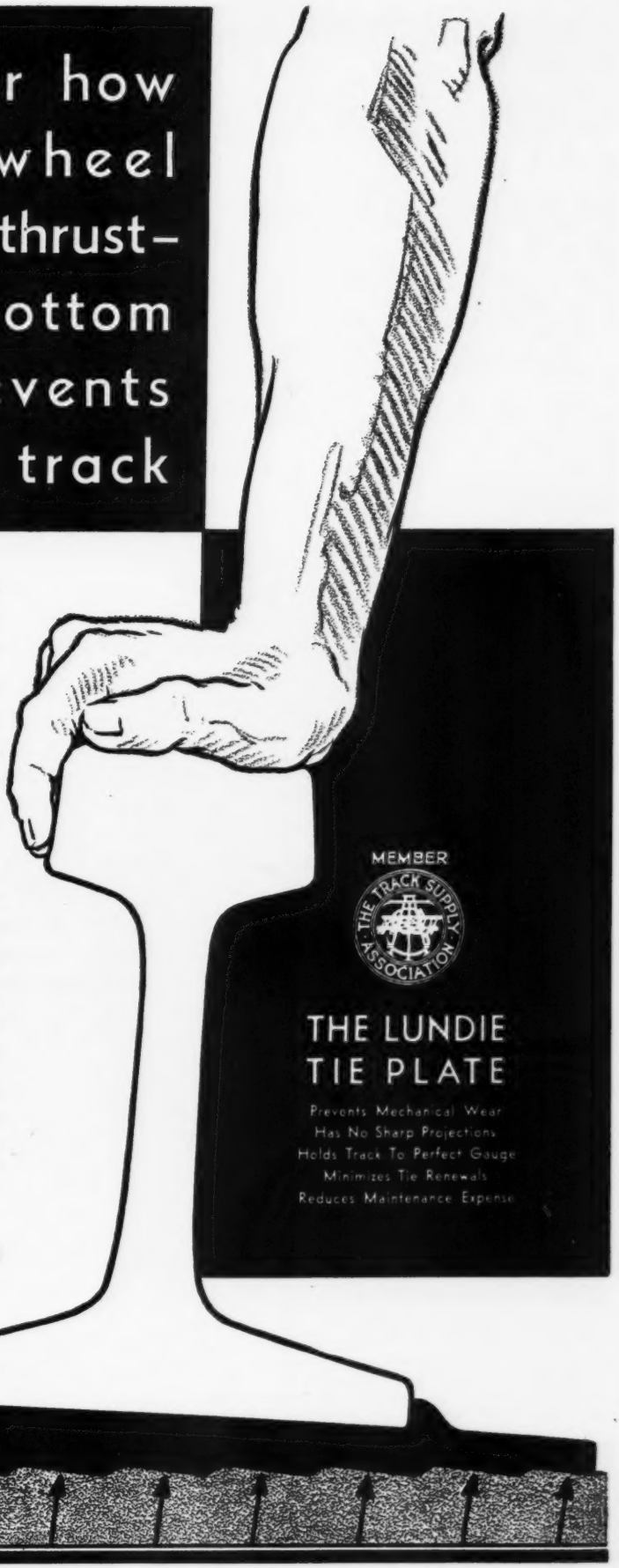
Published monthly by Simmons-Boardman Publishing Company, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, $2.00; Canada, $2.50; Foreign, $3.00. Single copies 35 cents. Entered as second class matter January 20, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

. . . No matter how heavy the wheel load and side thrust—this canted bottom tie plate prevents spreading of track

THE bottom of the Lundie Tie Plate is scientifically designed like a retaining wall to prevent sliding at the base. It provides at least ten steps of resistance against spreading, each inclined so as to bring the resultant load on plate at right angles to the multiple bearing areas on the tie.

With the above feature plus the rounded steps and adequate size, no matter how great the resultant force—it cannot cause the plate to slide, nor cut the wood fibres. The camber prevents rocking of the plate and excessive settlement into the tie. That is why the Lundie Tie Plate assures maximum tie life and minimum track maintenance.

The Lundie Engineering Corporation
285 Madison Avenue, New York
59 East Van Buren Street, Chicago



THE BETHLEHEM HEAT-TREATED CROSSING is an important advance in crossing construction. Made possible by a new method of heat-treatment developed by Bethlehem metallurgists, which gives standard-analysis carbon-steel rails greater wear-resistance than was ever before possible, this new crossing reduces the cost of crossing maintenance by about one-half.

For more than three years a number of Bethlehem Heat-Treated Crossings have been subjected to high-speed, main-line traffic at an important location on an eastern railroad. They have justified every claim, not only in respect to better wear-resistance and reduced maintenance, but improved riding qualities.

Experienced maintenance-of-way men who have seen how the Bethlehem Heat-Treated Rail Crossing stands up under severe service, and know the dollars that it saves, foresee its extensive adoption. It is made to A.R.E.A. designs and specifications.

The following comparison shows the increased tensile strength, higher Brinell hardness and other improvements in physical properties that the heat-treatment used in the manufacture of the Bethlehem Heat-Treated Crossing imparts to standard-analysis carbon-steel rails:

	Standard Rail	*Heat-Treated Rail*
Elastic Limit	83,000 lbs.	126,700 lbs.
Tensile Strength	137,800 lbs.	177,400 lbs.
Elongation	8.8%	7.7%
Reduction of Area	12.1%	11.7%
Brinell Hardness	282	361
Izod Impact	2 ft. lbs.	7 ft. lbs.

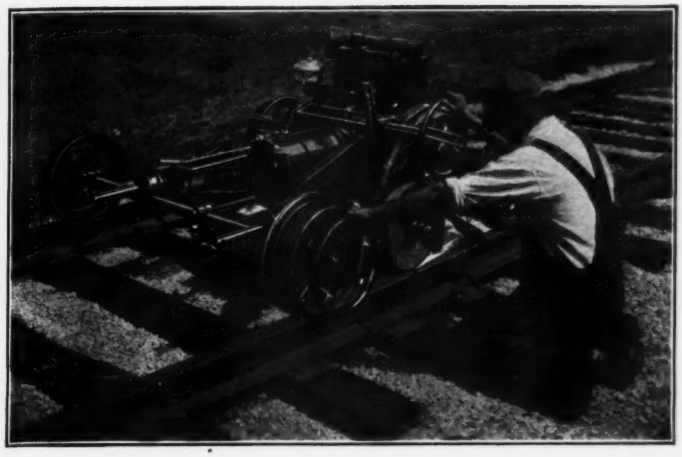
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

District Offices: Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Milwaukee, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM *HEAT-TREATED* CROSSING

Here are two NEW NORDBERG RAIL GRINDERS for your maintenance jobs

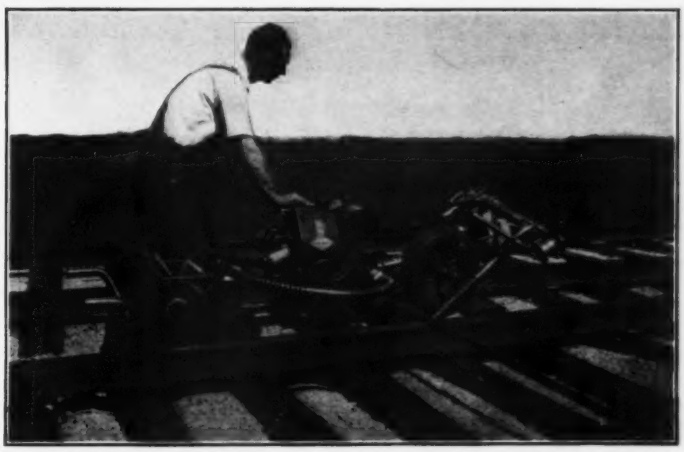


Surface Grinder

For heavy duty surface grinding of welded rails, this new Nordberg Grinder will do a faster and smoother job. The four cylinder, 12 to 16 horsepower, air cooled motor gives smooth operation and has ample power for the heaviest grinding. Flexible shaft with attachments furnished, if desired.

Utility Grinder

This simple, compact grinder with its attachments can be used for a variety of rail maintenance work. It can either be pushed along the rail on its steel rollers, or wheeled over the ties on the pneumatic tired wheel. With its low compact construction, it clears trains when placed between tracks.



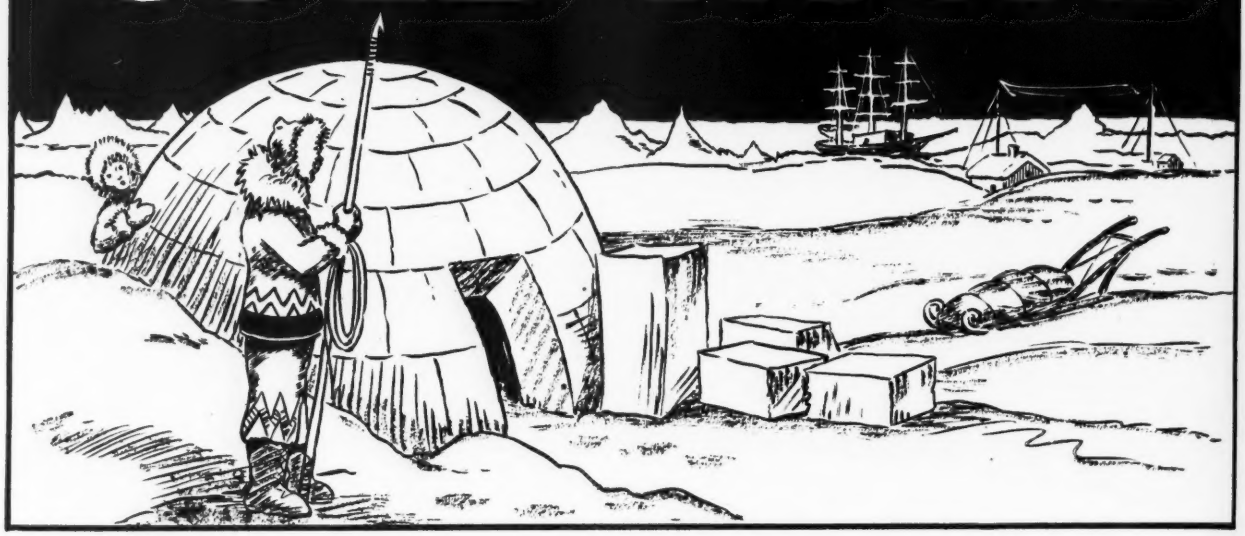
Look at the attachments for this grinder

1. Hand held, thin wheel for rail slotting.
2. Convenient guide for more accurate slotting.
3. Cup wheel for grinding flow from switch points and stock rails.
4. Radial wheel for much faster maintenance of switches.
5. Hand held, coarse grained wheel for grinding frogs, flangeways, etc.
6. Boring attachment for screw spike holes.
7. Radial wheel type surfacing appliance for rough finishing of welded joints.
8. Cup wheel type surfacing appliance for finishing joints and removing mill tolerance of newly laid rail. With this appliance, extreme accuracy can be secured.

Let us send you complete information on these grinders and other maintenance tools built by Nordberg.

NORDBERG MFG. CO., MILWAUKEE, WISCONSIN

COLD FACTS



One does not need to go to the South Pole with Commander Byrd for cold facts—here are a few regarding railway expenditures

In every one of the last 12 months the railways have spent **more** for the maintenance of their tracks and structures than in the corresponding month of the preceding year.

This increase has been progressively larger from month to month until in June, 1934, the latest for which figures are available, it was more than $6,800,000, a spread of 24 per cent.

In the first six months of this year, the railways spent $32,000,000 **more** for maintenance of way than in the first half of last year, while in the 12 months ending with June, the increase exceeded $41,000,000.

These are not idle statements. They are cold facts taken from official records. They demonstrate the increase in railway spending—and in railway buying—that has already occurred.

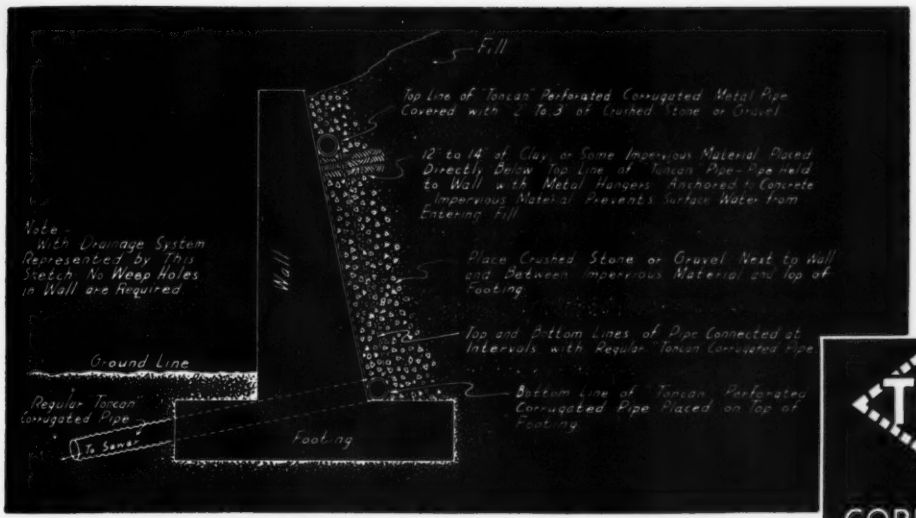
Are you as a manufacturer presenting the story of your products to those maintenance of way men of subdivision and division, as well as system, rank who are making up the programs and selecting the materials for their respective territories?

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

USE...

TONCAN IRON CORRUGATED PIPE

TO DRAIN TRACK ELEVATION PROJECTS


Fill
Top Line of Toncan Perforated Corrugated Metal Pipe Covered with 2 To 3' of Crushed Stone or Gravel
12" to 14" of Clay or Some Impervious Material Placed Directly Below Top Line of Toncan Pipe—Pipe Held to Wall with Metal Hangers Anchored in Concrete
Impervious Material Prevents Surface Water from Entering Fill
Note: With Drainage System Represented by This Sketch, No Weep Holes in Wall are Required
Wall
Place Crushed Stone or Gravel Next to Wall and Between Impervious Material and Top of Footing
Top and Bottom Lines of Pipe Connected at Intervals with Regular Toncan Corrugated Pipe
Ground Line
Bottom Line of Toncan Perforated Corrugated Pipe Placed on Top of Footing
Regular Toncan Corrugated Pipe
To Sewer
Footing

TONCAN
COPPER MOLYBDENUM
IRON
CORRUGATED PIPE

When track elevation requires a retaining wall, provision for adequate drainage facilities is essential. The fill back of the retaining wall will act as a huge basin for collecting water unless facilities are provided for handling this condition. Water standing in the roadbed will make the track soft, destroy good line and surface, and make a bad riding track. In the winter, the roadbed freezes, and if sufficiently impregnated with water will cause incalculable damage to the retaining wall. Toncan Iron Corrugated Pipe used as shown in the sketch provides an exceptionally satisfactory solution to this problem.

Toncan Corrugated Perforated Pipe possesses the necessary inherent strength to withstand tremendous superimposed loads; flexibility to resist frost and ice action, vibration from traffic and shrinkage of fill material. It is light in weight, available in long lengths and easy to install. The perforations in every corrugation insure rapid collection of water and proper drainage.

Toncan Iron, an alloy of refined iron, copper and molybdenum, is well known for its flexibility, long life in service and its great resistance to rust. Specify Toncan Iron Corrugated Pipe and reap the benefits—lower cost per year of use—more dependable drainage—lower cost of roadbed upkeep.

TONCAN CULVERT RAILWAY SALES
310 South Michigan Avenue, Chicago, Ill.

TONCAN CULVERT
MANUFACTURERS' ASSOCIATION
YOUNGSTOWN, OHIO

No. 69 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Mistakes

August 30, 1934

Dear Reader:

Has it ever occurred to you that one of the problems confronting the publisher of a magazine is that of determining reader interest? This is especially true of a publication like Railway Engineering and Maintenance which circulates among busy men who read it for information rather than recreation or amusement, for such men seldom write an editor unless they see something that arouses their disfavor.

Such an incident occurred in the last issue. In that issue, one of our good advertisers incorporated in his advertisement a drawing prepared to illustrate the use of his product, but also showing several men violating a safety rule that is well known to railway men but with which the artist was unfamiliar. The issue had scarcely gone into the mails before we received a letter from the chief engineer of a western railway calling attention to this illustration and pointing out the manner in which it departed from recognized safety practice. The next mail contained a similar letter from a supervisory officer on an eastern road, calling attention to the same infraction of safety rules. Similar comments have come from other readers by mail and phone, each a friendly word of caution.

In this entirely unintentional manner there has come, therefore, both to us and to the advertiser, proof of the reader interest in our pages, advertising as well as editorial, that is pleasing to us. While I have known, from my many contacts with you, of the care with which you are reading Railway Engineering and Maintenance, the promptness with which so many of you detected and called this error to our attention and the spirit which ran through these comments were pleasing and helpful to us and appreciated also by our advertiser and his artist.

Yours sincerely,

Elmer T. Howson

ETH*JC

Editor

MEMBER: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Give the Rail A Chance

ARE you going to install new rail and give it the same type of hard usage it received during the lean years?

The oxy-acetylene process offers you an opportunity to give the rail a chance; let it live a longer life.

If you decide to lay new rail, make provisions to extend its life by scientific hardening of the rail-ends by the Oxweld Process.

Or, if you decide to let the old rail carry on still further, take advantage of oxy-acetylene welding for the repair and rebuilding of rail ends, frogs, switch-points and crossings.

These two are only a few of the many applications of the oxy-acetylene process for production, repair, and maintenance work which your road can use to advantage.

Aided by the finest laboratory resources available, which are in turn confirmed in every instance by extensive testing through actual railroad practice all over the country and under every possible condition, the most modern developments of the oxy-acetylene process are made available through the service of The Oxweld Railroad Service Company. The Class I railroads of the country appreciate the fact that through this means only can they get this outstanding and progressive service as is evidenced by the fact that the majority of them have been listed for many years as contract customers.

Users of products and processes developed by Units of Union Carbide and Carbon Corporation benefit from a most unique coordination of scientific research with manufacturing, sales and service facilities. You are cordially invited to visit this summer the numerous exhibits sponsored by the Corporation in both the Basic and Applied Science sections in the Hall of Science at Chicago's 1934 A Century of Progress Exposition.

OXWELD RAILROAD SERVICE

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK: Carbide and Carbon Bldg. UCC CHICAGO: Carbide and Carbon Bldg.

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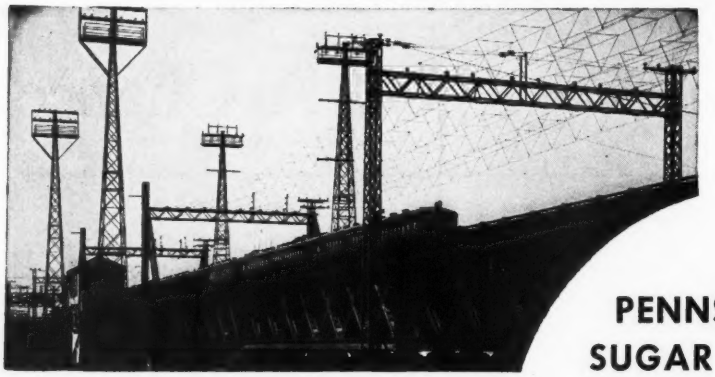

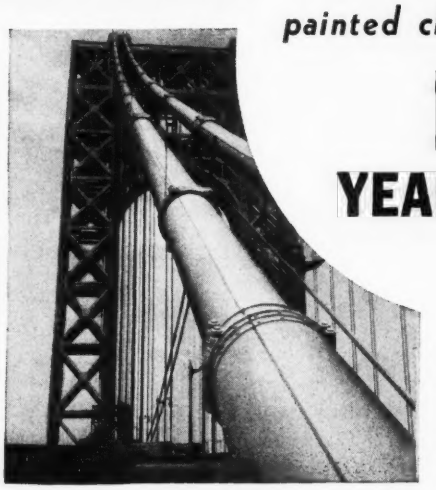

PENNSYLVANIA SUGAR COMPANY

painted char house steel

10 YEARS AGO

...RED-LEAD SURFACES *still in satisfactory condition!*

HERE'S the way the Pennsylvania Sugar Company feels about Dutch Boy Red-Lead.

In a letter dated November 2nd, engineer Dan Gutleben writes: "We have not used the Saucer Test*, which you sent us several months ago, because we have been using Dutch Boy Red-Lead for so many years that we decided there was no use wasting any time on tests.

"Ten years ago we painted our char house steel, using two coats of red-lead and pure boiled linseed oil, followed by a "lead" finishing coat. In 1931 we repaired the paint on two floors, while the rest is still in satisfactory condition."

A method of trying before buying

The Saucer Test mentioned above is an easy way to prove what paint gives iron and steel structures the most durable and economical protection.

The Saucer Test Kit comes to you free . . . just send coupon below. Includes metal saucer and sample of Dutch Boy Red-Lead to test against any other paint you wish. Choose your own conditions. Test under sun, heat, cold, moisture, smoke, fumes, salt air, water.

In a long series of tests conducted by a leading Southern railroad, the Saucer Test proved that pure red-lead far outlasted other paints tested.

But don't take our word for it or the word of others. Put red-lead *on the spot* yourself. Send for the KIT and see the evidence with your own two eyes . . . how pure red-lead gives greatest protection and saves money.

DUTCH BOY RED-LEAD

Dutch Boy Red-Lead is a fine, highly oxidized red-lead supplied in two forms—paste and liquid. The paste comes in natural orange-red, is readily mixed to brushing consistency, and can be tinted to darker colors. Dutch Boy Liquid Red-Lead (ready for the brush) is available in the natural orange-red, two shades of brown, also in black.

NATIONAL LEAD COMPANY

111 Broadway, New York; 116 Oak St., Buffalo; 900 West 18th St., Chicago; 659 Freeman Ave., Cincinnati; 820 West Superior Ave., Cleveland; 722 Chestnut St., St. Louis; 2240 24th St., San Francisco; National-Boston Lead Co., 800 Albany St., Boston; National Lead & Oil Co. of Pa., 316 4th Ave., Pittsburgh; John T. Lewis & Bros. Co., Philadelphia.

NATIONAL LEAD COMPANY
Please send *free* kit for making the "Saucer Test."

REM-9-34

Individual's name and title.....

Firm name.....

Street.....

City.....*State*.....

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

September, 1934

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Member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

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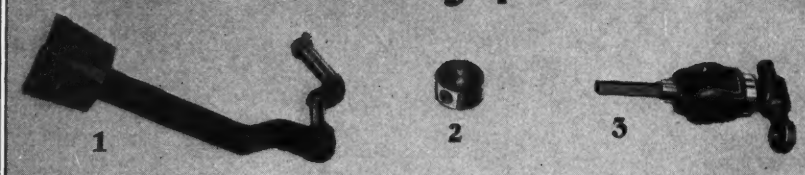
IT'S SO SIMPLE

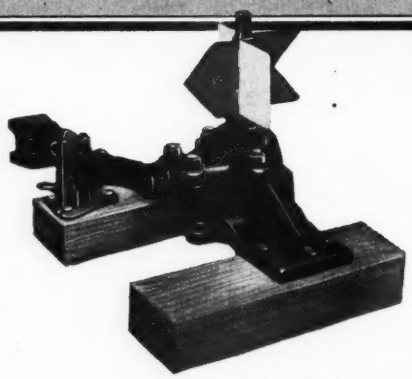
NRA MEMBER U.S.A. CODE RAILROAD SPECIAL TRACK EQUIPMENT MANUFACTURING

3 working parts



and 2 structural members

make up the RACOR XL-36 SWITCH STAND



SIMPLICITY is an essential of reliability in the low rigid type of switch stand. There can, for instance, be no gear trouble in a stand which *has* no gears. The fewer working parts, the less trouble from wear and the less lost motion in operation.

There are only three operating members in the Racor XL-36 Switch Stand. These, made of rolled or forged treated steel, with extra large wearing surfaces, combine to form an exceptionally simple, gearless, parallel throw stand, ruggedly designed for heavy service in yards, terminals and on main lines.

The working parts consist of (1) the handle and shaft; (2) the roller in which the bearing of the shaft is inserted; (3) the spindle fitted with a slot in which the roller slides. The base (4) and the cover (5) complete the Racor XL-36—the switch stand of simplicity. It is a stand that has stood the test of time and abuse in many thousands of installations on the country's foremost railroads. Write for our free folder describing its use and installation.

RACOR TRADE MARK REG. U.S. PAT. OFF.

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works, Limited . . . . Niagara Falls, Ontario
General Offices—230 Park Avenue, New York
Sales Offices at Works and McCormick Bldg., Chicago
Midland Bank Bldg., Cleveland, Ohio . . . . Metropolitan Bank Bldg., Washington
Builders Exchange Bldg., St. Paul . . . . Union National Bank Bldg., Houston, Texas
The Racor Works: Hillburn, N. Y., Niagara Falls, N. Y., Chicago, Ill., East St. Louis, Ill.
Superior, Wis., Pueblo, Col., Los Angeles, Cal., Seattle, Wash., Niagara Falls, Ont.

RACOR TRADE MARK REG. U.S. PAT. OFF.

Railway Engineering and Maintenance

16 REASONS

Why One Should Ship and Travel by Rail

THERE was a time not so many years ago when the railways offered almost the only means of transportation for all but the coastal areas. Then the traveler and the shipper turned almost automatically to the railways. That condition has changed and the railways are now confronted with most active competition on the highways, on the inland waterways and in the air. This competition is all the more serious because it is made possible in large measure by governmental subsidies, which fact places the railways at a disadvantage in matters of cost and of rates.

The loss in income resulting from the diversion of traffic from the railways to these subsidized agencies now approximates a billion dollars a year. Such a loss is so serious as to menace the security of position of every railway employee. It has already contributed materially to the separation of nearly 700,000 employees from railway service during the last five years. Many of these men will not be re-employed, even though industrial activity returns to the 1928-29 levels, because so much of the traffic which the railways then handled has since gone to these newer agencies of transportation.

Why Ship by Rail?

This competition constitutes a problem of the most serious import to every present and furloughed railway employee. It lends emphasis to the necessity for their exerting every effort to arrest this trend of traffic away from the railways to the buses and trucks, the barge lines and the airplanes. One very effective way in which they can do this is to see that those with whom they come in contact appreciate why they should ship and travel by rail. Here are a few of the reasons:

1. To increase highway safety and convenience. Our highway system was designed primarily for private passenger automobiles; yet today many principal arteries are all but monopolized by trucks, leaving a trail of accidents in their wake. A recent incomplete check of newspaper reports covering only 11 states for a period of but 7 months, showed that trucks were involved in a total of 4,225 accidents, resulting in the death of 690 persons and the injury of 4,970 more. Such slaughter should not be tolerated. It demonstrates that freight cars belong on the rails, not on the highways.

2. To protect local tax revenues. The railways are the largest industrial taxpayer in the nation. Their contributions to local, state and federal governments approximate three quarters of a million dollars a day. In many areas the railways pay half of the total taxes assessed. If, for lack of traffic, these lines are taken up, as more than 9,000 miles have been in the last 12 years, this source of support of public activities disappears and the remaining property owners must shoulder the loss.

3. To reduce freight and passenger rates. It is axiomatic that increased volume makes for lower costs and, conversely, that a declining volume increases costs. In our country of vast distances, low transportation rates are vital to prosperity, for farmer and industry alike. Any diversion of traffic to other agencies makes it necessary for the traffic remaining on the railways to pay higher rates. The return to the railways of even half of the traffic that has been diverted to other carriers during the last 10 years would make unnecessary the increase in freight rates which recent increases in costs are compelling the railways to ask for.

Highway Expenditures Increase Taxes

4. To reduce the outlay for highways. Road construction and maintenance constitute the largest single expenditure of the states in recent years. In 1929 they spent $127,000,000 for general government, $560,000,000 for education and $752,000,000 for highways. Numerous states are today spending twice as much for highways as for education. Highway expenditures alone were responsible for more than 54 per cent of all state bond issues outstanding in 1929. A large part of this expenditure bears no relation to pleasure car travel but is made necessary by the heavy trucks handling traffic diverted from the railways.

5. To reduce taxes. The increased costs made necessary by the use of the public highways by commercial freight transportation agencies must be paid by some one. In the nine years 1923-31, the funds made available for highway purposes aggregated $13,000,000,000. Of this vast amount, only $4,700,000,000, or 36 per cent, was collected directly from the users, mainly through license fees and gasoline taxes. The remaining $8,300,000,000, or 64 per cent of the total, was raised from other sources, mainly general taxation and bond issues based on public credit.

6. To increase railway employment. In the last five years the number of persons employed by the railways has decreased approximately 700,000. These were substantial citizens who maintained an above-the-average

standard of living and contributed to the prosperity of their various communities. Any return of traffic to the railways will be reflected in an immediate increase in railway forces and in spending on their part.

7. To increase railroad payrolls. Increased railroad employment will increase railroad payrolls. Railway wage payments in 1929 approximated $2,900,000,000; in 1933 they were only $1,400,000,000. This reduction in aggregate purchasing power of $1,500,000,000 has affected adversely every industry and every community. It can be overcome only by increased business on the railways.

8. To increase railway purchases. The railways are among the largest customers of the basic industries of the country. They normally use 23 per cent of the coal produced, 20 per cent of the forest products, 17 per cent of the iron and steel output, and other commodities in proportion. Railway purchases totaled $1,330,000,000 in 1929. They declined to $466,000,000 in 1933. The effect of this reduction of more than $850,000,000 in purchases has spread into every industry of the country. With the recovery of traffic and of earnings, the railways will again become large customers of industry.

9. To protect investment in railway securities. At the end of 1933 there were approximately 2,000,000 separate holdings of the $18,900,000,000 of railway stocks and bonds outstanding in the hands of the public. Much of this represents the savings of individuals in all walks of life; large amounts are held by insurance companies, as part of the protection behind individual policies. Vast amounts are also held by mutual savings banks as the investment of depositors' funds. With such widespread dissemination of railroad securities, the maintenance of their financial integrity is the concern of every individual, shipper and non-shipper alike.

Railways Provide Responsible Transportation

10. To obtain responsible transportation. No other transportation agency can provide the same high degree of service responsibility as the railways. When a shipment is entrusted to a railway, that railway accepts complete responsibility for its prompt delivery in good condition and backs it up with adequate financial responsibility. The same can be said of no other agency.

11. To avoid discrimination. The railways are required by federal law to treat all shippers alike as to rates and service. This protection applies to no other form of transportation. On the highways, for illustration, there are almost no dependable rates, truckers being free to make whatever rates may be necessary to secure the business and to change the rates upon a moment's notice. Railway rates, on the other hand, are matters of public record and are adhered to strictly.

12. To use facilities already available. The railways now have 4,750 steam locomotives and 340,000 freight cars stored in good condition awaiting use. It is estimated that they can handle twice their present volume of traffic with existing facilities. There is no need, therefore, to increase the investment in other transportation agencies in order to move the commerce of the country.

13. To safeguard existing rail facilities. Every important industry and commercial center and almost every village is served by a railroad today. Few of these industries or communities could exist if rail facilities were withdrawn. Yet, this becomes more than an idle threat when traffic is diverted to other agencies. Every shipper who patronizes these other agencies, for temporary gain, is striking at the very foundation of the commercial life of his community.

Aid in Emergencies

14. To have available an aid in times of distress. In every national disaster, whether it be a flood, an earthquake or a drought, the railways are called upon for special emergency services. In the San Francisco earthquake of 1906, in the lower Mississippi Valley flood of 1927, and in other disasters, the railways have provided the means of escape for thousands of refugees. At the present time, they have put into effect emergency rates on all supplies moved by the Relief Administration, on livestock moving from the drought-stricken areas and on feed moving into these areas, also on transients moved from place to place under the direction of relief agencies. Such are the contributions made by the railways, and only by the railways, in times of emergency.

15. To aid in national defense. In times of war the railways constitute a strong arm of defense. Their lines become arteries of great strategic importance. They render a service which no other agency of transportation is capable of rendering. To give the railways the traffic that will maintain their prosperity is, therefore, a vital step in our national defense. The diversion of traffic to other agencies is a blow to this objective.

16. To obtain the best and most dependable service. All things combined, day in and day out, in good weather and bad, the railways offer the cheapest and most dependable transportation service to be found. When this advantage is added to those enumerated above, they may all be summed up in a single sentence—ship by rail because it is good business and sound public policy.

ODD JOBS

Should Track Forces Do Work for Other Departments?

THE article on terminal maintenance by E. J. Brown, which appears on page 484 of this issue, makes brief reference to an oft-expressed grievance of the maintenance officers with respect to the demands made on track men for the performance of menial tasks for other departments. Whether this work embraces the cleaning and disinfecting of stock cars, or the transferring of lading from bad-order cars, the result is the same—the men are taken away from their regular duties. Advocates of this practice contend that much of the work thus required of track men is of a nature for which no other force of men is readily available, and that inasmuch as it must be done by some one, the assignment of such tasks to the track forces is the logical solution of a troublesome problem.

However, as pointed out in the article referred to, such work disrupts the programs of the track forces, which in the case of terminal maintenance, are already subject to serious interruption by such emergencies as are bound

to occur within the department itself. Perhaps there is no other way out and that the greatest economy is insured by imposing the odd jobs of the railroad on the track forces, but the fact that such work is required of them should receive adequate consideration in the preparation of labor allotments.

RAIL CORRUGATION

A Difficult Unsolved Problem

WHAT is causing rail corrugation, or "wash board" rail? Apparently, this question cannot be answered with authority as yet, in spite of the increased prevalence of this phenomena during the last few years and the increased attention which is being given to it. Many suggestions have been made, based on observations, deductions, and, in some cases, study, but there still seem to be almost as many different suggestions as there are commentators.

That there has been an increase in the amount of corrugated rail is only too evident to certain of the heavy-traffic roads in the East. The history of rail corrugations goes back at least a quarter of a century, but until recent years it has been uncommon and almost unknown on the steam railways, traces being found only infrequently, and then usually on the low side of curves. Many trackmen never had any experience with corrugated rail until the last few years, and those that had paid little attention to it. Today, however, it is a problem of real concern to many in charge of track maintenance, since it has become quite prevalent on several heavy traffic lines and is cropping out on other such lines. The Lehigh Valley has been particularly troubled with rail corrugation. On this road, the corrugations have a span of from 1½ to 2½ in. between high spots and depressions ranging in depth up to 10 thousandths of an inch, and even more in severe cases. The depth of the corrugations has appeared to grow under traffic up to a maximum of about 10 thousandths inch.

Quite naturally, those who have been troubled most seriously with corrugated rail first looked to the street railways, which have long been troubled with such rail, for an answer. The answer on these railways has been quite generally accepted as primarily one of equipment, which, however, is so radically different in design and operation from that used on the steam railways as to raise serious doubt that the cause on the steam roads might be the same.

That the corrugations might result from inferior rail appears to be out of the question in view of the fact that they are scattered over many miles of line. In fact, the corrugated condition on certain roads appears to exist without regard to local conditions.

The fact that the greatest prevalence of rail corrugation has been found in well-maintained main tracks of modern design, with heavy rail, large ties and liberal ballast section, has suggested that the rigidity of the track structure may be an important contributing factor in the development of the corrugated condition. This is discredited somewhat, however, by the fact that corrugations have been found in some branch line territory and in some main tracks of far less rigidity than the heavy duty main line tracks of the heaviest construction. Furthermore, at least one road with as heavy track construction in almost all respects as those roads most seriously troubled with rail corrugation, is almost entirely free of this difficulty, this being observed specifically in a recent inspection of the rails in approximately 350 miles of its main tracks.

Many a questioning eye has been turned on equipment as the cause of rail corrugation, consideration being given to rail motor cars, locomotives and cars. Rail motor cars were given serious thought for a long time until it became evident that rail corrugation existed on tracks on which this equipment had not operated. Heavy loading and high speed have also been investigated as possible contributing causes, and, while it is true that much of the corrugated track found is subject to both heavy loading and high speed, it is equally true that rail corrugation has been found quite prevalent on certain low speed tracks, and, on the contrary, entirely absent on certain branch line tracks which carry loads at least as heavy as those moved over certain main tracks affected quite seriously.

Heavy locomotives have received considerable attention as a factor in causing rail corrugation particularly with regard to counterbalancing. It is a recognized fact that many locomotives today, counterbalanced for an average speed of 35 to 45 miles an hour, are being operated at speeds far in excess of these figures. One road is quite positive that the primary cause is improper counterbalancing, pointing out that a growing corrugated condition in 1930 and 1931 was overcome by the counterbalancing of its locomotives which were being operated at speeds greater than for which they were designed.

Transverse corrugations on the treads of car wheels, closely resembling in several respects the corrugations found on the running surfaces of the rails, have also been advanced as the cause of rail corrugation. Many such corrugated wheels have been found in service on different roads, and while it is possible that they may have a bearing upon the formation of the corrugations on the rails, it is pointed out by those who discredit the idea, that if such wheels are causing the corrugations, the corrugations should be continuous over a road, which is not in keeping with the facts. Those who have given the subject the greatest attention have come more firmly to the conclusion that the formation of the corrugations on the running surface of track rails is not due to any one specific factor, but rather to a combination of factors, which may include, for example, high speeds, heavy loads and rigid track, with improper locomotive counterbalance and/or corrugated car wheel treads.

It is a question whether rail corrugation is increasing as rapidly now as it was two or three years ago. However, until such time as the cause is determined and removed, it does not appear to be consistent with good track maintenance to allow rails to remain corrugated even though this condition does not appear to affect the safety of the track in any way. Consonant with this belief, the Lehigh Valley has developed a car to abrade the running surface of the rail sufficiently to remove all traces of the corrugations, which car is described elsewhere in this issue. While this car is proving highly effective in removing rail corrugation, if it has once developed, the real problem is, of course, to ascertain the cause of this corrugation and to eliminate this cause.

Grinding C

Deep Rail Corrugations are Still Visible in the Rail at the Left After Five Passes of the Grinding Car

Nineteen Passes of the Grinder Completely Removed Deep Corrugations from the Rail at the Right

The Lehigh Valley has developed a grinding car, with a series of abrasive blocks, which is pulled back and forth over the track at high speed to remove the corrugations that have been a source of trouble on this and several other heavy-traffic roads during the last two or three years.

IN April of this year, the Lehigh Valley placed in service what is believed to be the first car designed by a steam railway to remove corrugations from the heads of rails. The car is pulled over the track at high speed and by means of a series of fixed grinding blocks held in contact with the rail head, abrades the head continuously in successive passes until all surface corrugations are removed. Smoothing up from four to nine track miles of rails a day, depending upon the depth of the corrugations and traffic conditions, the new car has already reconditioned approximately 125 track miles of rails, not only removing all traces of the corrugations, but also many other surface imperfections, especially at the ends of rails where batter has been overcome by welding.

Rail Corrugation a Real Problem

During the last two or three years the development of corrugations on the running surface of the rail has become a real problem on the Lehigh Valley, in common with a number of other heavy-traffic roads. Prior to this time, this problem was practically unknown on the road, being found only infrequently on the low side of curves. During the last few years, however, it has spread quite generally in patches over the entire main line of the road, on both curves and tangent track, the only places spared quite consistently being the sharper curves. Furthermore, the service age of the rail seems to have little bearing on the occurrence.

The corrugations have a span of from two to three inches between high spots and appear first as small shiny marks at more or less equal intervals on the wearing surface of the rail head. Growing under traffic, presumably, the markings become more distinct and appear as alternate dull and polished spots, with the dull colored depressions ranging generally from two to six thousandths of an inch in depth, but in many stretches reaching a depth of ten thousandths of an inch or more. While not considered hazardous to train operation, it was at once recognized that the corrugated condition is not conducive to quiet train operation and is destructive of the rail. Furthermore, it is felt strongly on the Lehigh Valley that through the vibrations set up, the corrugations contribute materially to the destruction of the track surface, with resulting low joints, loose joint bolts and generally increased maintenance. It is also felt that the vibration set up cannot have other than a detrimental effect upon the rolling stock moving over the track.

Confronted with the problem, the road has made extended study of the cause of the corrugated condition, giving consideration to its locomotives, rail motor cars, car wheels, wheel loads, train speeds, and numerous other such factors, as well as to the characteristics of the track structure itself. However, to the extent that the rail was already corrugated, which totaled several hundred miles, a problem equally as important as that of discovering the cause of the corrugations, was that of developing a means for removing them. This consideration led to a study of the available grinding equipment on the market, and, ultimately, to the design and construction of the grinding car now used.

Car Has Many Special Features

The new grinding car, which is novel in almost all respects as regards construction and manner of operation, is essentially a tank car, approximately 47 ft. long between coupler centers, equipped with a series of grinding blocks on each side which can be lowered on to the surface of the rail under pressure, and, in this position, while being flooded with cooling water, can be pulled along the rails at the most desirable speed by a steam locomotive or other suitable unit of equipment. In general, the car looks like a standard tank car, the most conspicuous part being its standard tank of 5,700 gal. capacity. However, there is little standard about the car other than the tank and the car frame, and certain features such as wheels, axles, springs and bearings. The special features of the car include the grinding block mountings, or carriages, with their

Corrugations Out of Rail

operating cylinders, specially designed four-wheel trucks with long wheel bases to support certain of the block mountings, air reservoirs at one end for the direct operation of the block-lowering mechanisms, an operator's cab at the other end, housing the controls for raising and lowering the blocks, and systems of air and water piping essential to the operation of the grinding units.

Long Wheelbase Trucks Necessary

There are eight grinding units on each side of the car, two between the wheels of each truck and four centrally between the trucks. Each of these units includes three grinding blocks, 10 in. by 9 in. by 3½ in., with one of the 10-in. by 3½-in. surfaces exposed to the top of the rail head. As a result, each unit exposes 30 lineal inches of abrasive surface to the rail.

The principal reason for concentrating certain of the grinding blocks within the limits of the trucks is that it is only at these points that the different parts of a car maintain a relatively fixed position laterally with respect to the rails, regardless of the track alinement. In other words, grinding blocks located at these points remain directly over the rails, regardless of the degree of curvature, while located through the center of the car, between trucks, they move laterally across the rail as the car body assumes the position of a chord to the curve of the track. On curves above a certain degree the lateral movement of blocks located between trucks is sufficient to take them entirely off the rail, a condition which would prevent the removal of the corrugations on the rails of such curves if it were not for the grinding units mounted between the wheels of the different trucks. To permit the mounting of grinding units within the limits of the trucks necessitated the special design of trucks employed on the car, which have a wheelbase of 10 ft.

In the different grinding units, the individual blocks are held in position by bolts moulded in their top face, which extend up through the top plate of the mounting, and also by end guide plates and side cover plates. Each unit of blocks is raised and lowered by an air cylinder mounted directly above it. 8-in. by 12-in. air brake cylinders being adapted for this purpose. In their raised position, the blocks clear the rails by approximately three inches.

The truck-mounted grinding units and their operating air cylinders are fixed rigidly to the side plates of the elongated truck frames so that the pressure of the lowered grinding blocks on the rails is not affected by the action of the truck springs supporting the car frame. On the other hand, the units between the trucks, being mounted on the car frame, are affected slightly by the truck spring action. This undoubtedly affects the uniformity of the pressure contact of the blocks of these units on the rails.

Groups of Units Controlled Separately

Air for the operation of the grinding units is taken directly from the train line. This is first introduced into two connected air reservoirs, or storage tanks, at one end of the car, each with capacity for 30,317 cu. in. of air. At the point of air introduction there are two valves, one to reduce the pressure admitted, and the other to cut down the velocity of the air so that it will not reduce the pressure in the train line low enough to cause application of the brakes.

From the air reservoir the air is piped to the operator's cab at the opposite end of the car, and thence, in separate systems for each side, to the truck-mounted grinding units and to those located in the center of the car. Thus, the truck and center units on each side can be operated independently of each other, and also independently of the similar units on the opposite side of the car.

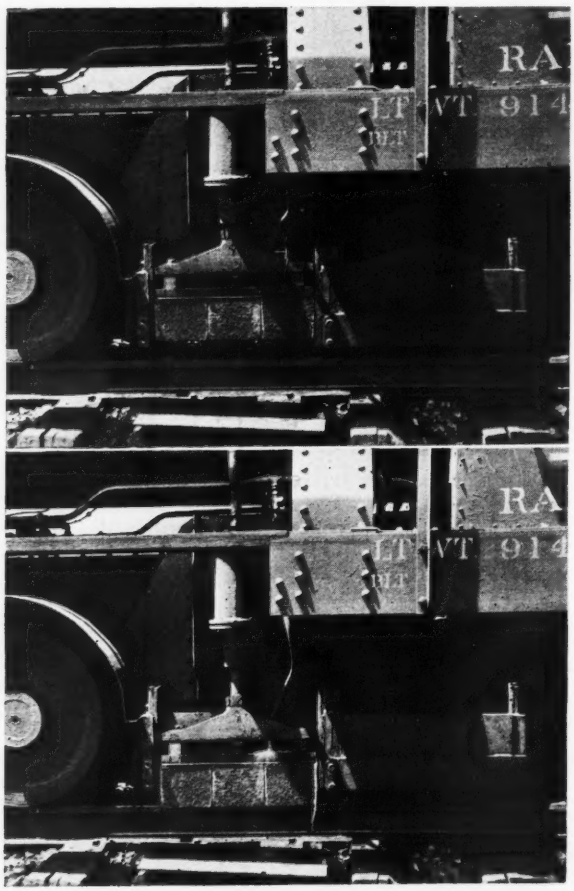
Control of the grinding operations is centered in the operator's cab where there are four hand-operated, two-way valves, waist high and in line with each other, for control of the different grinding units. Within the cab there are also several other valves, including a pressure reducing valve, which is set to produce the required pressure in the block-operating cylinders, and four special valves, which are adjusted to leave a certain amount of air in the cylinders so that when the air

All Grinding Blocks Up, Clearing the Rail by About Three Inches

is applied the cylinder pistons will not force the grinding blocks down on the rails with a hammer blow. A pressure gage, also located in the cab, shows the pressure which is being used on the grinding blocks. Other valves in the air systems include individual hand valves ahead of each air cylinder, provided so that in case of emergency or the failure of any one of the grinding units, that unit can be raised and cut out of service without affecting the remaining units.

Details of Grinding Water Systems

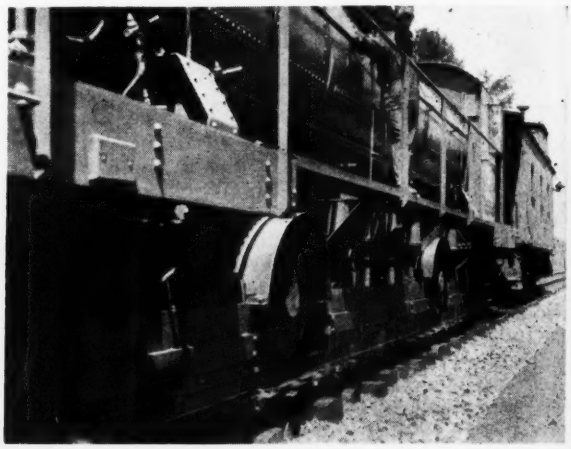
While grinding is under way, cooling water is applied constantly to all of the grinding blocks and to the heads of the rails directly beneath the blocks, the water being supplied from the 5,700-gal. tank on the car body. To effect this, a special water piping system is provided on each side of the car, with flexible hose connections to the top plates of the block mountings and to pipe discharges directed at the top of the rail immediately ahead of and behind the different groups of grinding units. Since the top plate of each block carriage has a number of holes drilled through it, the water applied at one point on its top side distributes itself quite uniformly throughout the length of the unit and runs down around, through and between the individual grinding blocks, a considerable amount finding its way directly on to the head of the rail.



Exposed View of Three of the Blocks Down in Grinding Position Above—Two of the Grinding Units, One With its Cover Plate Off, Showing the Blocks in Raised Position

A feature of the water system is that it is fitted with air-controlled valves, so arranged that when the air is turned on for lowering the different grinding units, the same air also opens the water valves of the corresponding units. When the air to the grinding unit cylinders is cut off, the water valves are closed. Thus, automatically, the water flows when the blocks are in grinding position, and stops when they are raised from the rails.

As already mentioned, the cooling water is stored in the tank body of the car, where the supply is replenished when the locomotive takes water. While this large cooling water supply is desirable, a much smaller supply would be adequate for the amount of grinding that can be done between the times the locomotive must take on boiler water. The reason for carrying such a large amount of water is for ballast purposes, to steady the car frame and to resist the lifting force of the grinding units when forced downward against the rails.



The Grinding Units Down in Grinding Position—Note the Flow of Cooling Water

Grinding Speed 40 to 45 M. P. H.

The grinder car is operated over the tracks with a locomotive and tender, and a caboose. The operating force, aside from the train crew, includes a car operator and two helpers, designated as observers. The track supervisor on whose territory the car is operated, or a representative from his office, accompanies the car to familiarize its crew with curve and switch conditions on the territory worked, but he is not considered a member of the crew.

In the actual operation of the car, four to six miles of track are generally worked at a time, the train passing back and forth as many times as is required to remove the corrugations completely. In the work thus far, the number of passes required has varied from as few as 6 to as many as 30, with an average of 13. While grinding a speed of from 40 to 45 m. p. h. is maintained, it being found that greater grinding efficiency is thus secured than at any lower speed. Furthermore, this results in a relative speed between the blocks and the rails which is substantially the surface speed of the usual emery grinding wheel.

The pressure applied in the cylinders of the grinding units is approximately 60 lbs. per sq. in., which results in a pressure of approximately 35 lb. per sq. in. on the grinding blocks. This pressure has been found best suited to grinding with the blocks that are being used at the present time and sets up about as heavy friction on the rails as can be overcome readily by a 2-8-2 locomotive with a total weight of 150,000 lb. on the

drivers, which is the class of locomotive generally used to pull the car. According to one of the locomotive engineers assigned to the grinding train, the locomotive draw-bar pull in operating the grinding car is equivalent to that when hauling approximately 50 loaded freight cars on level track.

Operation in Grinding Service

When in grinding service, the car operator stations himself in the operator's cab, and the observers take positions on the catwalks on opposite sides of the car, near the center. Facing forward, the observers watch such track conditions as alignment, switches and road crossings, and relay instructions for raising and lowering the grinding blocks to the operator by means of cord and bell signals, different sounding bells being used to differentiate between opposite sides of the car.

Ordinarily, all of the grinding blocks are held on the rails through the road crossings, but they are all raised as they pass over turnouts in order to avoid becoming chipped or broken. The truck-mounted grinding units are held on the rails on all curves, regardless of degree, but because of the lateral movement of the center grinding units with respect to the rails, these units are raised out of service on all curves of five degrees or more to prevent the possibility of their dropping off the rails. Since curves of five degrees or more are the exception rather than the rule, and in any event exhibit the least amount of rail corrugation, this necessity for raising the center blocks is not a disadvantage of any importance.

Four to Nine Miles Ground a Day

All of the grinding is done under traffic, and, ordinarily, clearing for trains leaves only four or five hours a day for actual grinding. In these hours the grinding train is generally operated from 100 to 125 lineal track miles, although this may be confined to one or more relatively short stretches of tracks. On the basis of an average of 13 passes to remove the corrugations, this results in the smoothing up of from about 8 to 9 track miles of rails each day. On the basis of 25 passes, which is necessary where the corrugations are ten thousandths inch or more deep, 100 to 125 operated miles results in the conditioning of only 4 to 5 track miles.

While the car is not considered in its ultimate state of refinement, and while it is felt that better grinding blocks may be developed, the car at present removes the rail corrugations and restores a perfectly smooth running surface on the rails. An indirect advantage gained in the grinding is that of smoothing up the ends of rails which have been built up by welding, it having been found that during the course of removing the corrugations, the condition of the welded ends is materially improved.

The grinding car described was designed by C. A. Miller, supervisor of maintenance-of-way equipment on the Lehigh Valley, under the direction of G. A. Phillips, who was chief engineer maintenance of way until February of this year. It was built in the mechanical shops of the road at Packerton, Pa. Operation of the car is under the direction of G. T. Hand, chief engineer, with jurisdiction over maintenance of way matters, and under the immediate supervision of Mr. Miller and of the different division engineers.

The Grinding Train Is Operated over the Track in Successive Passes at from 40 to 45 M.P.H.

Poor Cross-Level Held Cause of Derailment

A DERAILMENT of a passenger train on the Northern Pacific near Big Lake, Wash., which resulted in the death of an employee and the injury of two other persons, resulted from the rocking of the tender, by reason of unequal distribution of the load and aggravated by irregular track surface. This is the conclusion given in a report of the Bureau of Safety of the Interstate Commerce Commission, from which the following information was taken.

From the statements of the train crew and other evidence, it appears that the rear truck of the tender derailed first and ran on the ties for a distance of 2,630 ft., to a point where it encountered a turnout for a spur, with a resultant derailment of all equipment except the locomotive. Intermittent flange marks on the ties where the wheels were first derailed, indicate that there was a severe rolling action of the tender just prior to the derailment. At the point of the initial derailment, the track is on an embankment about four feet high, and for most of the year there is standing water near the base of the fill, a condition that has led to frequent burrowing of the embankment by mountain beavers. The effect of the holes thus produced was shown by track levels taken after the accident, since for some distance in advance of the point of the derailment one rail was alternately ¼ in. higher or lower than the other and at one place the left rail was 1 in. higher. This condition, plus the presence of two decayed ties under a joint close to the initial point of derailment, is believed to have aggravated the tendency of the tender to roll to an extent that caused the rear truck wheels to leave the rail.

A Present Day Adaptation of the Intermittent Type to the Plant of the Chesapeake & Ohio at Huntington, W. Va., Capacity 3,000,000 Gal. of Water Per Day

Better Boiler Water— What Has Been Done About It*

By R. C. BARDWELL
Superintendent of Water Supply,
Chesapeake & Ohio, Richmond, Va.

ACCORDING to available records, the first plant for softening water on an American railroad was installed in December, 1891, on the Oregon Short Line (Union Pacific System), and the second in 1896 on the Southern Pacific at Port Los Angeles, Cal. Both of these employed the Porter-Clarke process, involving the use of soda ash to eliminate the non-carbonate hardness, and hydrated or unslacked lime to remove the bicarbonates. Like other early plants, they were of the intermittent type, many of which are still giving good results. This simple and practical arrangement consists of two or more tanks in which the successive processes of filling them with water, introducing the chemicals, agitation and settlement are carried on in one tank while the treated water is being drawn off from another.

The efficiency obtained in such plants has not been exceeded appreciably in even the most modern installations, owing largely to the stirring up of the old sludge in these old plants as each batch is introduced, since this promotes the chemical reactions and provides the nuclei for the formation of the new precipitate in larger particles that will settle more readily. There is no complicated machinery and all parts are readily accessible and easily understood. The disadvantage lies in the amount of space required and a lack of flexibility where the number of tanks is limited.

The First Continuous Plant

The first "continuous" lime-soda plant was installed by the late C. Hershel Koyl on the Rio Grande Western at Helper, Utah, in 1900. The term "continuous" implies the addition of the softening chemicals to the water as it is pumped, so that it flows, in turn, through a reaction chamber and a sedimentation chamber, the softened and clarified water being delivered from the latter to the storage tank or direct to service lines. Such equipment naturally attracted inventive possibilities that resulted in patents and organized sales promotion. This proved of distinct benefit to the railroads, as these developments focused attention on the economies to be obtained from improved water supplies. As a consequence the installation of railroad water softening plants received a distinct impetus in the decade from 1900 to 1910. The "continuous" plant has been subject to further development since that time and is the type of plant now usually provided for the lime-soda process of water softening.

The present status of water treatment on the railroads represents the result of 40 years of experimentation and practical experience. This article presents the story of this development and an appraisal of the various methods employed.

There are on the market several proportioning devices which have been found to provide sufficiently accurate proportioning for dependable results if given the required attention and supervision. In most of the early "continuous" type plants this proportioning device was placed on top of the tanks, but this was objectionable because of the inconvenience in keeping a check on the operation and in making repairs. All later developments have been centered on ground-operated proportioners, which embrace such devices as orifices, weirs, tipping buckets, meter controls or various sizes of simple displacement water engines connected to chemical pumps.

*Abstracted from a paper presented before the Southern and Southwestern Railway Club at Atlanta, Ga.

A Large Continuous Type Water Softener—Plant of the New York Central, at Elkhart, Ind. Capacity 3,600,000 Gal. of Water Per Day

The discussion thus far has been confined to treatment with lime and soda ash, because these chemicals are employed in the great majority of the plants owing to the fact that they will produce the most practical and effective softening results at the least cost. Unslacked lump lime is the least expensive, but owing to the difficulty in handling and deterioration in storage, most railroads have found it more desirable and economical to use the more stable hydrated lime which can be obtained at a slight increase in cost, can be housed safely in a less expensive building, and does not require so much care in handling and storage.

The use of barium hydrate and barium carbonate has sometimes been advocated because of the obvious advantage of precipitating and removing the sulphate radical that is possible with these reagents, whereas this is always left in the water in the form of the soluble sodium sulphate when soda ash is employed in the treatment. The high price and the low reaction value of the commercially available barium salts (which contain a large amount of water of crystallization), as well as their high molecular weight, have discouraged developments along this line.

Refinements in Treatment

During the past ten years the development and use of coagulants in railroad water softening have been given considerable attention. Alum has been employed with some success at several places. Copperas, apparently, was first used on an extensive scale by Mr. Koyl to assist in preventing after-precipitation in locomotive injectors or branch pipes. The use of either of these materials is objectionable in many waters treated for boiler purposes because of the increase in the residual sodium sulphate which aggravates foaming conditions, and, in some cases, pitting and corrosion as well.

Possibly the greatest incentive toward the use of a coagulant in railroad water treatment was the commercial development of sodium aluminate. In the treatment of many waters, especially in lime-soda plants, sodium aluminate serves better as a coagulant than either alum or copperas, which react better at a lower pH value. Furthermore, the floc formation of the calcium and magnesium aluminates which are produced obviates the necessity of adding the additional soda ash which is required to neutralize the acidity of the other coagulants. Curtailment in the use of soda ash keeps down the alkali salt concentration. It has also been noted that the use of sodium aluminate appears to speed up the chemical reactions and force them to earlier completion, aiding especially in breaking up the soluble double salt of sodium-magnesium carbonate which frequently gives trouble during cold weather.

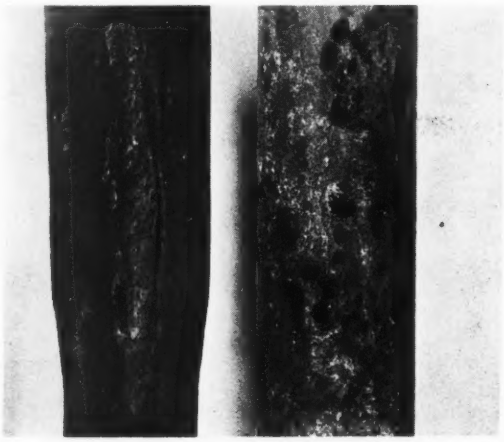
The use of sodium aluminate makes it easier to carry a lower residual hardness in the final water than is possible with lime and soda alone, and the results are reflected in improved boiler performance. On some waters similar results can be obtained with alum, but this material does not appear to have the desired flexibility in application that can be obtained with aluminate. Good results are also claimed for this material in breaking up and eliminating hard silica scale. In recent years some railroads have conditioned the water at many of their stations by providing "wayside" treatment involving the introduction into the water as it is delivered to the storage tank, of sodium aluminate alone, or mixed with soda ash, caustic soda or tannins.

Interpreting the Results

In discussing lime-soda softening it might be well to dwell briefly on what are considered satisfactory results. In the first place, sulphate or non-carbonate hardness should not be tolerated in water for steam boilers, as this is the binder material which forms the hard destructive scale and which will also absorb mud or soft carbonate scale to increase the bulk of the hard formation. It is therefore necessary to add sufficient soda ash to neutralize this sulphate or non-carbonate hardness and carry an excess of from two to five grains per gallon in order to assure freedom from any damaging reversible reactions. Sufficient lime should be added to eliminate the bicarbonates and the magnesium, which must be precipitated as a hydrate, and carry an excess of from two to four grains per gallon to force the reaction to completion and prevent reversible reactions. An exceptionally good lime-soda treated water will then contain not more than one grain per gallon of hardness, with about four to six grains of alkalinity of which two to four grains is hydroxide.

Probably the least expensive system of water treatment in use on American railroads, so far as first cost is concerned, is the application of soda ash to each roadside tank supply in sufficient amount to neutralize the non-carbonate hardness and carry an excess sodium alkalinity of approximately two grains per gallon in the water delivered to the locomotives. This process was first applied intensively on the Chicago, Burlington & Quincy between 1905 and 1910. Various methods are used for introduc-

ing the soda ash, and the amount is controlled by frequent check tests of water samples taken from the locomotive boilers, as well as the wayside tanks. Experience has shown that the best results were secured when the excess of the alkalinity over the hardness of the boiler waters is maintained at not less than 15 per cent of the



Corrosion Presents One of the Most Perplexing Problems Encountered in Water Conditioning

total dissolved solids. Where careful and regular check supervision is given, followed by a well planned blow-off schedule to maintain the content of dissolved solids below the critical foaming point (about 250 parts per 100,000 for such treated waters), very satisfactory improvements in boiler conditions have been obtained.

Zeolite Treatment

Water softening with zeolite mineral has been one of the latest developments of water treatment on railroads. This method was first tried on the Erie at Marion, Ohio, in 1914, and was rejected as unsuitable because the excessive amounts of dissolved solids remaining in the water caused serious foaming. However, since 1923 more than 60 zeolite plants have been installed on the Southern Pacific system, and others are in service on the Northern Pacific, the Baltimore & Ohio, the Missouri-Kansas-Texas, the Atchison, Topeka & Santa Fe, and the Chesapeake & Ohio. Where the water to be handled is clear and low in carbonates, good results should be expected from a properly designed and properly operated zeolite plant. With a muddy or turbid water, or one high in carbonates, lime treatment with sedimentation will probably prove more effective. Failure of high-capacity artificial zeolite under heavy service conditions has also been a source of trouble, and future installations will probably embody the use of the natural or green sand zeolite, if the cost for wash water is not excessive. Experience also indicates that zeolite plants should be given just as much chemical supervision as lime-soda plants. If this is not done, trouble may be expected to develop.

"Wayside" Treatment of the Water, as It Is Delivered to the Service Tank, Has Been Applied to Many Stations of Moderate Demand

Interior Treatment

Success in the conditioning of waters of average hardness by "interior" treatment, involving the use of proprietary boiler compounds, has been reported where such treatment has been carried out under an effective plan of supervision, in conjunction with a suitable blow-off schedule which will prevent the excessive accumulation of the solids precipitated in the boilers. One of the unfortunate features of this method in the past has been the flowery and extravagant claims made by unscrupulous purveyors of "cure-all" boiler treatment, who promised to accomplish exactly what was desired, although these claims could not be substantiated in laboratory tests. When the material would fail to produce results, as was frequently the case, "new and improved" products would be offered and tried, with further delay and expense, and discredit to the idea of water treatment.

Genuine advance in this field has been confined largely to the cases where the treatment has been carried out under technical supervision and control. The compounds used ordinarily contain soda ash or caustic soda together with various forms of tannins which delay the reaction in the cold and are supposed to prevent trouble from the scaling of exterior water lines, and to stimulate the formation of the floc during precipitation under pressure in the boilers. In many cases of the direct "interior" treatment, tri-sodium phosphate is used with the other materials, and in some instances sodium aluminate, sodium chromate, graphite, and mercury. Formerly sodium silicate, disguised by various coloring agents, was frequently offered for railroad use, but during government control a careful investigation by federal chemists developed the fact that this material was detrimental in steam boilers, as it produces a hard silicate scale.

"Anti-foam" compounds have been used advantageously in territories of highly mineralized waters. These comprise a mixture of castor oil emulsified with tannins and colloidal material, such as starch or dextrose, which have the property of mixing with the cold water in the engine tenders and tend to inhibit the formation of froth or foam in the hot boiler waters.

The Objectives

The three main objectives of railway water treatment, in order of importance, are to prevent the formation of scale, to prevent pitting and corrosion, and to overcome foaming.

(1) *Scale Prevention:* In view of the damage and expense caused by hard adherent scale, and the small expense incurred in the elimination of the non-carbonates that produce it, by means of soda ash or other chemicals, the effectiveness of which has been demonstrated repeatedly, the continuance of such troubles can be attributed only to a failure to take advantage of an economical remedy. If the hardness of the water going to

the boilers is maintained at less than the alkalinity, hard scale troubles can be avoided, and if this scale is removed in a complete softening plant before delivery of the water to the locomotives, good results are assured.

(2) *Pitting and Corrosion:* Problems arising from corrosive action on the metal of boilers, fire-boxes and tubes are much more difficult of solution than those relating to incrustation, as they involve considerations other than the quality of the water. Among these other factors are the design of the boiler, the storage of the boiler materials and their handling and fabrication. From the standpoint of water quality, it has been found that if sufficient chemicals are added to maintain the sodium alkalinity in the boiler water at not less than 15 per cent of the total dissolved solids, the pitting due directly to minerals or acids in the water will be eliminated, and progressive corrosion from other causes will be held at a minimum.

(3) *Foaming and Water Carry Over:* Foaming is one of the most serious troubles from an operating standpoint as it interferes with the movement of traffic after the train has started. Foaming is caused when the concentration of dissolved solids and suspended matter reaches the critical point at which the bubbles of steam formed at the contact with the hot sheets will no longer burst readily and free the steam, but build up on the surface until the steam space is filled with froth and the water boils over into the cylinders. This critical concentration varies with the design of the boilers and with the type of service. It has been found best practice to determine this critical concentration point for the various classes of locomotives on their respective districts, and then arrange a blow-off schedule which, if carried out, will prevent concentrations in excess of this critical limit.

The federal locomotive inspection law requires the removal of all washout plugs in washing boilers every 30 days. In bad-water territories it was formerly considered necessary to change the water or wash the boiler as often as each trip, but with properly supervised blow-off schedules it has been found that better boiler conditions can be obtained with blow-downs than with water changes. In highly mineralized sections, "anti-foam" preparations may sometimes be used to advantage, but a well regulated blow-off schedule should be followed.

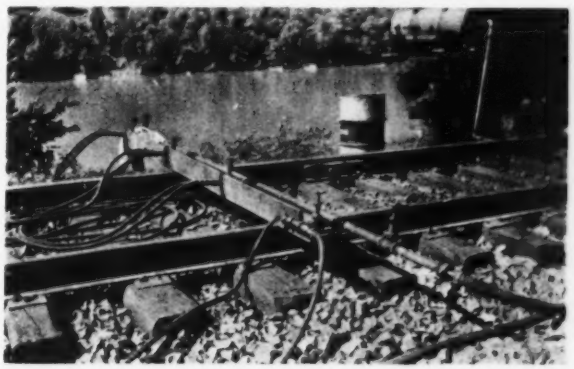
What of Future Development?

An interesting check on the progress made in railroad water treatment is afforded by the annual reports of the Water Service committee of the American Railway Engineering Association. A survey made in 1904 indicated that there were 257 water treating plants in service on American railroads at that time, the majority of these being constructed after 1900. In a report made in 1918, it was estimated that the number of treating plants then in service was 550 and that they treated about eight per cent of the water used for steam purposes. At the present time it is estimated that there are about 1200 complete lime-soda plants, treating 90,000,000,000 gal. of water annually; 650 soda-ash or sodium aluminate wayside plants, treating 15,000,000,000 gal.; 350 sources of supply where the water to the extent of 18,000,000,000 gal. is treated with compounds; and 95 zeolite plants, treating 12,000,000,000 gal. According to this estimate, 135,000,000,000 gal. of water is now receiving some form of treatment annually on American railroads, and as this represents only about 40 per cent of the water being used for steam purposes, it would seem that there is still opportunity for further progress in this field, and as the power units become larger and demands for economy more exacting, continuously increasing attention to water treatment problems will be required.

Air Delivery to Tampers Made Easy

DISTRIBUTION systems are being employed on the Chesapeake & Ohio for the delivery of compressed air from a compressor to pneumatic tampers which possess the dual advantages of convenience for the tamper operators and ease of assembly and dismantling. These distribution systems are being supplied to gangs of 14 men equipped with Ingersoll Rand eight-tool tamping outfits.

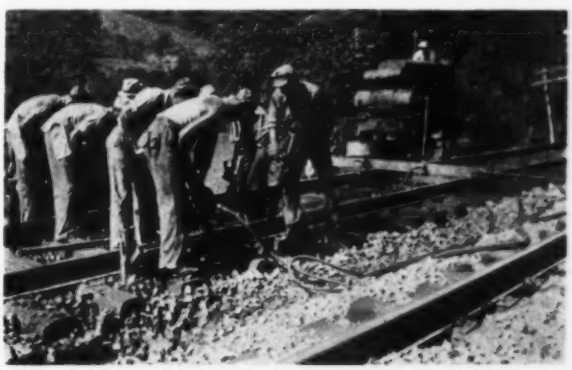
The main distributing line consists of 1260 ft. of 2-in. wrought pipe, made up in units 60 ft. long that consist of three 20-ft. lengths of pipe joined by standard



The Manifold in Position Across the Track

pipe couplings. These sections are connected by means of standard 2-in. unions for convenience in assembling and dismantling. This pipe line is provided at intervals of 160 ft., with 1¼-in. outlets, each of which is equipped with a cut-off cock and a standard 1¼-in. hose coupling.

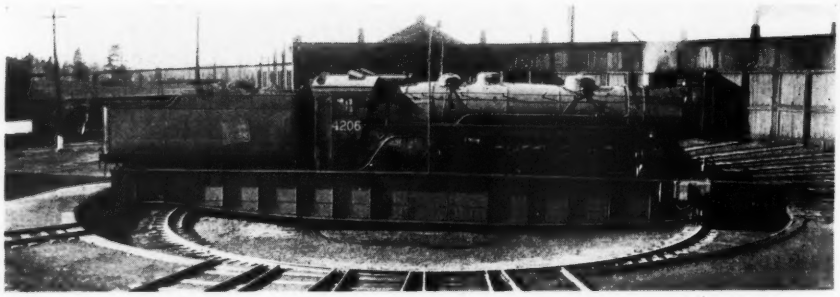
This pipe layout is used in connection with a system of hose lines which may be connected to any one of the 1¼-in. hose couplings on the pipe line. The main supply line is a 100-ft. length of 1¼-in hose with a stand-



The Manifold Is Easily Slid Along the Rails as the Work Proceeds

ard hose coupling on each end. This delivers the compressed air from the pipe line to the manifold from which the air is distributed to the individual tamper lines. This manifold, which is made up of 1¼-in. pipe, is 9 feet long and is equipped with a globe valve and a standard 1¼-in. hose coupling at each end, either one of which may be connected up to the 1¼-in. supply

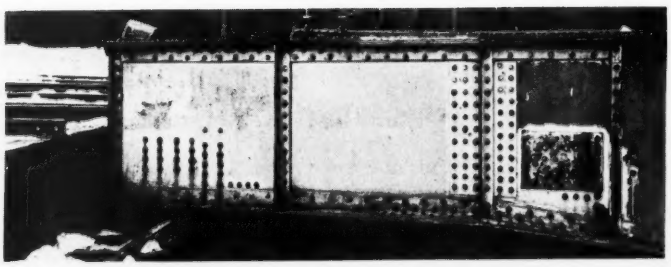
(Continued on page 483)



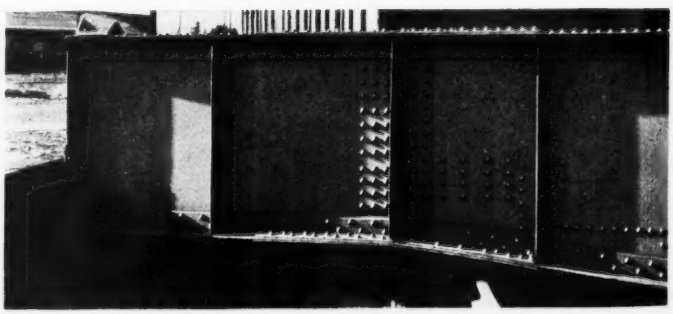
Old 73-ft. 8-in. Turntable at Joliette, Que., which Was Lengthened to 89 ft. 1¾ in. in 1929

Adding Life to Old Turntables

How these structures have been lengthened and reconditioned to handle longer power now being used on the Central region of the Canadian National



In this Case, the Circle Rail Was Moved out to the End of the Extension



In this Table, the Extension Overhangs the Circle Rail and End Truck

DURING the last eight or ten years, the Canadian National has lengthened and strengthened a considerable number of old balanced-type turntables, which had become inadequate by reason of increases in the length of locomotives and would otherwise have had to be replaced with new tables. In addition, it has rebuilt the original centers of many of the old tables, affording them a truer roller bearing action. Practically all of this work has been done in the field with a minimum of expense and of delay to the normal operation of the tables themselves. Sixteen old tables, including 12 at important division points, have been lengthened and strengthened on the Central region of the road alone. The work on these tables is made the basis of this article. In every case, the changes have proved highly satisfactory and economical, the cost having averaged only about one-tenth of the cost of new modern tables.

The tables lengthened were originally of different lengths, ranging from about 73 ft. to 80 ft., out to out, but all of them were of similar design, involving two main through plate girders with lateral bracing below a tie deck of 10-in. by 16-in. timbers supported on shelf angles riveted to the webs of the girders. The tables were designed originally to carry locomotives with wheelbases of 48 ft. with loads of 49,400 lb. on the drivers. In the overhauling work, the tables were increased generally to 95 ft. 6 in. in length and strengthened sufficiently to permit the turning of Super-Santa Fe and Northern type engines, with wheelbases of 80 ft. 9¾ in. and 82 ft. 4¾ in., respectively, and loads on the drivers in excess of 65,000 lb. In all cases the tables continue to function as balanced tables.

Beam and Stringer Deck Provided

The strengthening work in each case was done by removing the old timber deck system completely and substituting therefor a regular system of floor beams and stringers, with new lateral bracing in the plane of the bottom flanges of the through girders. In general, three 24-in. floor beams have been spaced at equal distances on each side of the existing center panel, with two lines of 24-in. I-beam stringers between them, one directly under each track rail. High gusset plates have been used

This Old 73-ft. 8-in. Table at Monk, Que., Was Lengthened to 94 ft. 4½ in. in 1930

in the floor beam connections, which so stiffen the top flanges of the girders against crippling sidewise that the new floor systems have produced the strengthening desired without the necessity for increasing the cross-section of the main girders in any case. All of the new deck pieces required in each strengthening job were fabricated to order, and, to simplify the field work, were furnished with connection angles and plates riveted in place, so far as this was possible.

A feature of the new floor system is that they dispense entirely with timber ties, the track rails being attached directly to the floor beams and stringers by clips without any form of cushion between them. Two types of specially bent hook bolts have been used for this purpose, made from ¾-in. round rod, and threaded at one end to receive a standard nut. The bolts securing the rails to the floor beams extend up through holes in the top flanges of the beams and lap over the rail base, being brought to a tight bearing in each case by means of a nut and washer applied on the under side of the flange. The bolts securing the rails to the stringers, on the other hand, pass through holes drilled in the rail webs and are bent downward in such manner as to hook over the top flanges of the stringers. These bolts are each fitted with a nut and spring washer on the end extending through the rail, and, by alternating them to the right and left and adjusting the nuts, the rails are clamped rigidly in true alinement.

To permit walking across the tables with safety, a plank deck is provided between and outside the rails, made of 2-in. by 10-in. timbers spiked to 2-in. by 12-in. nailing pieces and battens, laid flat.

The new lateral bracing provided beneath the deck is of the usual type, with crossed 3½-in. by 3½-in. angles tied together at the center and joined to the lower flanges of the main girder through ⅜-in. gussets. In each case, all of the bracing has been designed for and delivered to the job, shop welded into individual cross units, requiring only field riveting to the girders.

Sections Added in Lengthening Tables

The lengthening of the tables has been effected in all cases by splicing equal length girder sections to the ends of the main girders and extending the new floor system provided on the original structure. Two methods of making the extensions have been employed, depending upon conditions. In some cases, where the existing circle rail was found to be in good condition, it has been continued in service, together with the table end trucks, in their original positions, and the extension sections have been cantilevered out to a new circle wall. In other cases the old circle rail has been discarded and removed, a new outer circle rail provided, and the table trucks moved out to the ends of the extension sections. In all cases, the old concrete back wall had to be removed and a new circle wall constructed, the character of the new wall depending upon ground conditions.

Typical of the material required in the table extensions is that used in increasing a 75-ft. table to one 95 ft. 8½ in. long. Here, 10-ft. 4¼-in. girder sections were added to each end. In developing the strength of the connections, the new and old web plates were brought together in a riveted butt joint, with adequate splice plates on both sides, and the flanges were similarly spliced by means of cover plate splices, as well as with angles placed over the existing flange angles.

To facilitate the field work of lengthening the tables, and thereby minimize the time required for this work, all of the new material has been shop-riveted as far as possible, the end extensions, for example, being furnished as assembled units with floor beams, stiffeners and lateral bracing in place. Furthermore, just as much preliminary work has been done on the old tables as possible, this including principally the cutting out of any rivets affected and replacing them with bolts, and the drilling of the new rivet holes required. All of this preliminary work has been carried out between regular movements of the tables, without taking them out of service. The actual reconstruction of the table decks and the addition of the new end sections, on the other hand, has almost always required that the tables be taken completely out of service, since this work has required about two days in most cases. However, in one case, a spare table was lengthened and strengthened directly alongside the pit of a short table, and was then set in place by derricks after the old table had been lifted out; the actual change-over requiring only a few hours.

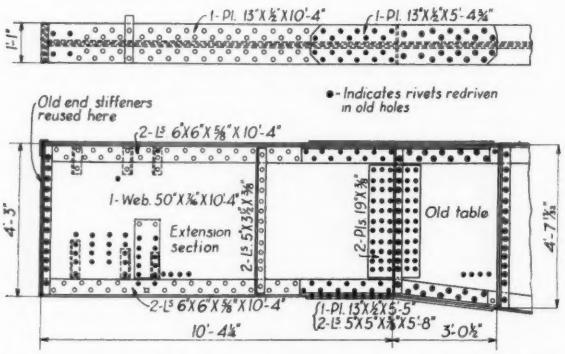
Details of Enlarging the Pits

The enlarging of the old table pits has been done largely in the usual manner, working first in the area not occupied by approach tracks, and then taking one track out of service at a time. In this work, the new circle wall is constructed, and the old concrete back wall is then removed, usually by "shooting," using 1¼-in. round sticks of dynamite, 8 in. long, placed in holes drilled about 3 ft. apart. While this wall is being removed, the approach track rails are cut off, drilled and spliced at the new circle line, and the material between the new and old circle walls is excavated, the tracks being removed one at a time and replaced on timber stringers and blocking. If a new circle rail is to be provided, the necessary piles are then driven and capped to support it, again removing the rails temporarily from one track at a time for this purpose, and later, the new circle rail itself is laid. Where the old circle rail is continued in service and the table extensions are cantilevered from the ends of the old table, these latter operations are, of course, not necessary.

Several types of new circle walls have been employed when lengthening the tables, depending somewhat upon the character of the supporting material. These have included timber piles with a plank bulkhead, timber cribbing and steel sheet piling. In the last type of con-

struction, second-hand piling has been used, usually in lengths of 4 to 20 ft. This material has been found to make a highly satisfactory circle wall, and is now used wherever rock is not encountered.

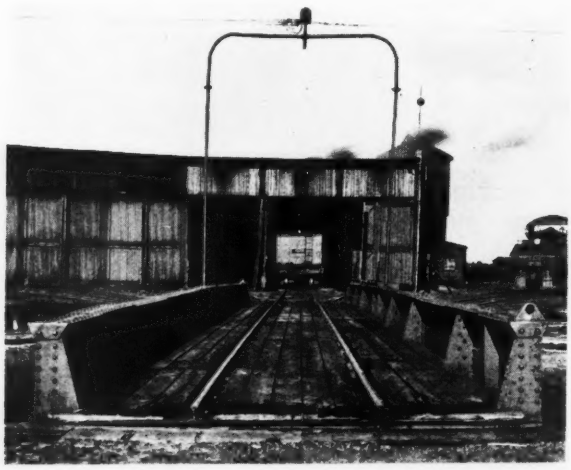
Upon the completion of the work of enlarging the pit and the preliminary work on an old table preparatory to lengthening it, the actual rebuilding of the table has been carried out in the following manner. First, the table is taken out of service, the approach tracks are removed, the deck is rebuilt as described earlier, and then the new



Typical Details of the Extension Section for a Balanced-Type Turntable, and of the Spliced Butt Joint Used

extension sections are lifted into place by a derrick or crane and are connected up. Bolts are used in making all of the connections in order to speed the work, and then, later, after the table is restored to service, rivets are substituted, working during periods when the table is not in use. Following the procedure outlined, it has never been necessary to keep a table out of service for more than two days.

The number of men employed in altering the tables has varied with the different operations involved, but within the period that the tables have been out of service, the field force employed has generally included approximately 12 men, made up of 6 to 8 bridge men and 4 to 6 trackmen. The average cost of lengthening and



In the Rebuilt Tables, Ties Are Eliminated, the Rails Being Fastened Directly to the Stringers and Floor Beams of the New Floor System

strengthening the 16 tables on the Central region, including materials, labor and equipment charges, has been approximately $4,100. In all cases the rebuilt tables have proved entirely satisfactory.

During the same period that the Central region has been rebuilding its old short tables, it has also been rebuilding the old roller-type centers supplied originally with many of the old tables. In these old centers, in which conical shape roller bearings were merely placed loosely in a housing between upper and lower tracks, the bearings wore unevenly and got out of line, and, as a result, bound and stuck, making operation of the tables difficult. In remedying this condition, the old bearings were removed and each was drilled to receive a 1¼-in. round steel shaft through its longitudinal axis. Thus altered, the bearings were assembled in a nest with inner and outer live rings, and were then replaced in the old center casting, altered suitably to receive them, and provided with a new lower bearing track.

This relatively simple alteration of the old centers, done at an average cost of about $350 per center, completely remedied the bad operating condition existing in the original centers. That this is true is evidenced by the fact that many of the rebuilt centers have been in service more than eight years without giving trouble in any respect.

The altering of the centers in each case was done in a bridge shop equipped for handling such work, while the relatively simple work of removing and reinstalling the centers was done by the bridge department forces of the railroad. All of the work described has been carried out under the immediate direction of C. P. Disney, bridge engineer, Central region, of which T. T. Irving is chief engineer and W. A. Kingsland is general manager, all with headquarters at Toronto, Ont.

New Methods for Handling Car-Mounted Welders

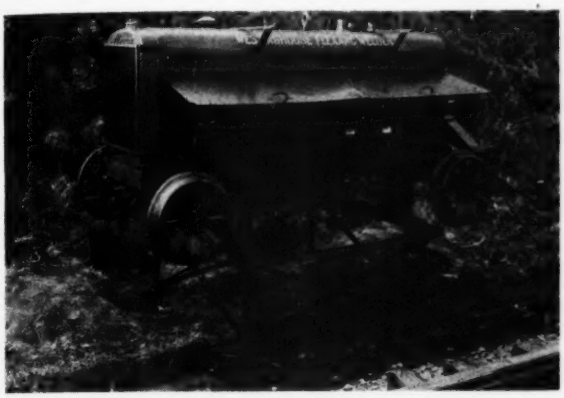
IN the operation of car-mounted electric welding outfits, a number of appliances have been developed to facilitate the handling of these machines and the conduct of the work, most of which may be applied with equal effectiveness to other similar types of equipment. Among such appliances are a ramp for loading welding generators, grinders and motor cars on flat cars, a setoff for facilitating the removal of welders from the

Showing the Ramp That Is Used for Loading the Welding Equipment

track, and a convenient reel cart for handling the welding cables.

As shown in one of the illustrations the ramp for loading the welding equipment on a flat car consists of two 30-lb. rails supported by two steel horses and bolted to rails that are spiked to the floor of the car. The equipment is pulled up the ramp by means of a steel cable attached to a geared hand winch located at the opposite end of the car. It is said that the ramp can be assembled and the welding and grinding equipment loaded on the car and blocked in one hour by three men.

The setoff for welding generators consists of two steel horses, each of which is provided with screw jacks in the legs for adjusting the level of the setoff. The horses, each of which carries a short section of 30-lb. rail for engaging the four double-flanged setoff wheels of the welder, are spaced accurately to gage by removable angles. The welder is rolled onto the setoff over a removable section of 30-lb. rail. When not in use, the steel horses and connecting angles of the setoff may be loaded on brackets provided for this purpose on the welding generator. It is claimed that the entire operation of assembling the setoff and removing the machine from the track can be accomplished by four men in 10 min. or by two men in a slightly greater time.



A Welding Generator in Position on the Setoff

Two-Wheel Reel Cart

Another of the accompanying illustrations shows a two-wheel reel cart by means of which the cable is moved along the track. This device is used by inserting the plug at one end of the cable into the socket on the control panel of the welder and then pulling the reel along the track to the point desired.

This View Illustrates the Comparative Ease of Transporting Cable by Means of the Reel

The information regarding these devices was supplied through the courtesy of the Norfolk & Western, Roanoke, Va., and the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Air Delivery to Tampers

(Continued from page 479)

hose line. Four T-fittings in the manifold, spaced 2½ ft. center to center in the length of the manifold, provide ¾-in. outlets for the tamper hose, each one being equipped with a globe valve and a ¾-in. male "Y" air hose coupling, thus providing connections for eight ¾-in. tamper hose lines each of which is 25 ft. long.

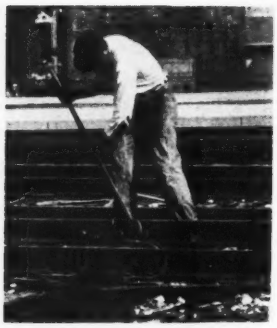
An essential feature in the application of this plan, which has an important bearing on its effectiveness, is the placing of the manifold in a transverse position across the two rails of the track on which the tamping is being done, just behind the gang. The friction of the pipe on the rails is so slight that it can be slid along easily as the work progresses. In track circuit territories, the pipe is insulated from the rails by supporting it in a wooden trough made by nailing a 4-in. board, placed on edge, to a 6-in. board laid flatwise, notches being cut in the former for the ¾-in. branch outlets of the system.

Among the advantages of this distribution system is the fact that it permits a gang to work on 160 ft. of track (or more if necessary) from one connection to the pipe line, and to work on 1,260 ft. of single track or 2,520 ft. of double track without shifting the pipe line, and double these distances from one location of the air compressor. In working on double track, the pipe line is laid in the center ditch so that it can serve each track. Moreover, the pipe line is readily taken up and relaid. With two men to uncouple the line into the 60-ft. sections and recouple it at the new location, and four men to load the sections on two truck cars, move them to the new location and string them out, the line can be transferred in 20 minutes from the time the tampers stop working until work is again restored.

The gang employed with this outfit consists of a foreman and 13 men, distributed as follows: Eight men operating the tamping tools, two men filling in ballast to the tampers, two men handling the jacks and the spot board, and assisting in filling in ballast, and one man looking after the compressor and making light repairs. Each tie is tamped on eight faces, all tampers working on the same tie at the same time, the average performance being 700 ft. of track in an 8 hr. day.

We are indebted for the above information to O. K. Lawson, assistant cost engineer, Chesapeake & Ohio, Hinton, Va.

Orderliness and Neatness in the Storing of Maintenance of Way Materials Are Not Overlooked on the Erie at Buffalo, N.Y.



Track Maintenance

The upkeep of tracks in large yards involves the same operations that confront the foreman and supervisor on the line. But the conditions under which the work must be done introduce special problems that test the enterprise and ingenuity of those in charge. The essentials for success in terminal maintenance are discussed in this article, which comprises an abstract of a paper presented before the Maintenance of Way Club of Chicago

By E. J. BROWN

Roadmaster, Chicago, Burlington & Quincy, Chicago

TERMINAL maintenance is so diversified as to embody nearly all the "ins and outs" of railroading. A great many requisites for success in the conduct of terminal maintenance could be mentioned, but none is more important than an effective organization of gangs and competent foremen. During the last few years the railroads have been compelled to curtail their forces, with a resultant reduction in the number of gangs and a corresponding increase in the responsibility imposed on the foremen retained. While yard sections vary widely in size and in the number of men allotted to them, the gangs are usually small. On the Burlington, the largest section, with 53 miles of tracks and 242 switches, has been allotted six laborers. One man in each gang is designated as a track inspector, whose duty it is to spend about three hours each day looking over the tracks and switches on the section. He is required to carry a gage with him at least once each week for the purpose of using it on all turnouts and curves where wide gage is likely to be found. This practice has resulted in such a reduction in derailments that we are convinced that the time spent in these inspections is well worth the cost.

To supplement the work of the reduced section forces, we have a floating gang of laborers and a foreman, that is moved from one section to another as conditions indicate that the section gangs need help to complete their programs. Of course, where major surfacing work on three or four miles of main track becomes necessary, an extra gang is assigned to the operation, but the floating gang fits into the terminal organization very well. One advantage it offers is that it obviates the doubling up of section gangs for work that requires a larger number of men, which is an objectionable practice because it interferes with routine work of the individual gangs.

How Valuable Time May Be Lost

As it is, there are too many sources of interference with the work of the section gangs. One of the common evils of terminal maintenance is the practice of calling on trackmen to do work for other departments, such as sweeping out buildings, transferring lading from bad-order cars, or helping the water service forces. Such tasks have no connection with track work and should not be required of the section forces. It is best also to make special provision for special duties. For example, the care of switch lamps should be assigned to a lampman; one man can look after about 300 of them.

Much has been said and written about the programming of section work, and the idea has received general acceptance among maintenance officers. It provides an objective for both the supervisor and the foremen. But any program set up for work in terminals should be sufficiently flexible to make adequate allowance for the emergencies that are bound to occur.

Our general program for a season's maintenance work, starting in March or April, calls in turn for the cleaning up of yard tracks and leads to remove the dirt and refuse accumulated during the winter months; the replacement of worn rails, frogs and switch points; crosstie renewals; and track surfacing. This work should be completed by September, to be followed by the renewal of switch ties and the preparation of the switches for winter. This consumes the time up to the advent of cold weather, when, with reduced forces and the interference of winter storms, productive work is necessarily confined to such items as gaging or the changing of broken or worn rails. Fighting the elements, which occupies a large part of the time of the gangs during the cold season, necessarily falls outside the possibilities of programming.

Tie Renewals Impose Special Problems

The out-of-face surfacing of yard tracks should be carefully planned by the supervisor and section foreman and enough of this work done on each section during a maintenance season so that all tracks on each section can be gone over about every seven or eight years. Through

The Advent of Welding Has Resulted in a Decrease in Frog Renewals, As they Can Be Repaired in Track

in a Busy Terminal

the co-operation of the store department, we have been able to get ties for such out-of-face surfacing, delivered at the time the work is done. This enables us to place a car of ties at one end of the track in which they are to be inserted, and to distribute them directly, thus avoiding the rehandling that is required if they must be unloaded in advance at some central point. An empty car is likewise placed at the other end of the track, on which the old ties can be loaded as they come out. This is compulsory where the tracks are closely spaced, and also permits ready compliance with the rule of safety that requires the picking up of all released ties at the completion of the day's work. The tie spacing should be checked to insure that they are placed in accordance with the standard requirements for each section of rail. When the ballast, usually pit cinders, is dressed, it should be left slightly open to allow space for the accumulation of foreign material until the cleaning season.

When surfacing important leads, serious consideration should be given to the ballast, if good results are to be

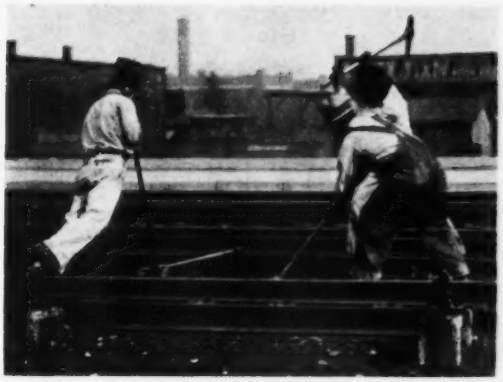
The Section Foreman Should Confer with the Yard Master with a View to the Selection of a Time for Work when Traffic Is Lightest

obtained. It is sometimes necessary to dig the foul ballast out and replace it with good material, such as commercial cinders or whatever good ballast material is available. The surfacing of main tracks in a terminal is always expensive as the ballast becomes foul very quickly. Where gravel is used, the tracks should be skeletonized; if stone is used, it must be cleaned. This necessitates the loading of dirty or foul ballast.

Because it is necessary to avoid encroachment on the headroom at overcrossings, definite limitations are imposed on the raising of track in certain locations, and this has led to the policy of inserting ties while the track is skeletonized. This, of course, saves time in tie renewals, but it is my experience that where this kind of work is done, the new ballast should be unloaded each day over the stretch of track that is being worked, since otherwise the ties will shift under traffic and double work will be required to respace them.

Put the Right Kind in the Right Place

Tie renewals comprise one of the most important operations in good terminal maintenance. By this I mean that we should have good ties where good ties are needed; i. e., around the heel of frogs, ahead of switch points, around sharp curves, in short, wherever gage is likely to get wide. So far as possible we should avoid digging in



Adequate Attention to Gage Is Important in Terminal Maintenance

ties, as this is a slow and costly job. Of course, broken or decayed ties should be replaced, but digging ties in should not be made a general practice. Tie renewals should be checked carefully to ascertain that the proper grade of tie is used in each class of tracks, that is, No. 3 ties for important leads, No. 2's in ordinary yard tracks, No. 1's or usable rejects in less important tracks of repair yards and in team tracks, and second-hand ties, when available, near the ends of stub tracks. A great many tie renewals are required by mechanical wear or by constant gaging, and often when these ties are renewed they can be used again in less important tracks by turning them over.

The switch-tie renewals should be carefully checked by switch numbers from a list showing the number of each length required for each switch, so that the foreman can order and insert them in accordance with the list. It is often possible to make a saving in switch tie renewals by cutting short ties out of old long ones. For example, an old 12-ft. tie that has to be taken out because of wear can be cut off at each end to make a 9 ft. or 9½ ft. switch tie or even a track tie.

Turnout Maintenance Is Important

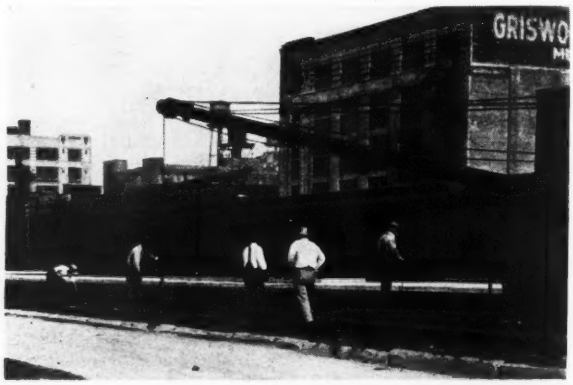
Turnout maintenance is one of the most costly items as it requires the renewal of frogs, guard-rails, and switch-points, all of which are expensive. Frog bolts should be kept tight to eliminate, so far as possible, any working of the frog which might cause it to break. Good ties should also be provided under the frogs, and proper gage should be maintained to eliminate expensive wear. Adequate protection of the frogs also requires that the bolts on guard rails be kept tight and that they be maintained at proper gage.

In the adequate maintenance of switch points we have the secret of terminal maintenance; as more derailments occur at switch points than on any other part of the track structure. The switch point, also, is the one element of the turnout that requires the most frequent renewal, and careful inspections should be made to determine whether a switch point should be replaced or repaired by welding. We should see that the heel of the point is maintained at the proper level so that point will not vibrate when wheels are passing over it. They should always be adjusted properly, and by this I mean not merely putting nutlocks between the No. 1 rod and the point, but the use of the adjustment in the rods. Since switch-point protectors are on the market and will extend the life of the switch point, they should be used where traffic warrants. In this connection we should give

adequate attention to the tie plates, which play an important part in the elimination of derailments. Turnouts equipped with large tie plates on sound ties will rarely give trouble due to spread rails, if inspections are made at frequent intervals.

Railroad Crossings Require Constant Maintenance

The maintenance of railroad crossings and slip switches is of great importance, as both are expensive and if not properly cared for will have to be renewed before they have given the service expected of them. Railroad crossings require constant maintenance, among the most important features being proper drainage and good line and surface. Expenditures for the maintenance of crossings depend largely on the angle of crossing and the traffic over them. Slip switches require about the same amount



Cranes Are a Big Help in Handling Heavy Material

of attention. Their renewal is always a source of "grief" to the supervisors. If traffic is so heavy that the track cannot be taken out of service for the renewal of a slip switch, it will have to be assembled outside of track and moved in with a derrick. This method is costly as work-train expense is involved, but it has to be resorted to in many instances.

Rail Replacements

The changing of rails in various parts of the terminal is another job that is almost a daily task in heavy traffic yards. In most cases it is necessary to drill all the holes in a rail, in addition to cutting it to length, before setting it into place. When ordering rails for these renewals, the class of rail—No. 1 or 2, select scrap or new—should be given the same consideration as in ordering ties. Careful planning in rail renewals will lessen the amount of waste. Rails on curves should, where possible, be taken from the high side and placed on the low, using the new or second-hand rail on the high side.

The advent of welding has resulted in a decrease in frog renewals, as frogs can be repaired under traffic so that their life in track will be two or three times what it was formerly. When it is necessary to insert a new frog or switch point, where it must be connected up with old rail, poor joints can be corrected by building up the adjacent ends of the old rails. The welding of switch points in track has also resulted in economy, but such work should be checked carefully and the welder instructed when and where these points are to be welded. In extensive angle bar renewals through yards, the welder can save considerable time and money by cutting the rusted bolts on the old bars.

Construction work in yards has been a minor item during the last few years but may assume greater importance at any time, and in the usual procedure it falls on the maintenance organization. Typical of such work was a job carried out some years ago, involving the replacing of No. 7 frogs with No. 9 frogs at the entrance to a busy yard during a period of heavy traffic. It required the moving of every switch and the renewal of all the switch ties. The completion of this work with minimum interference with the operation of the yard required that it be started on a Sunday night and continued for 24 hours without interruption. In another case of the same character, 13 switches were laid complete by 60 men in 9 hours. The secret of such work is to distribute all material on one day, in readiness for the actual change on the day following.

Power Equipment

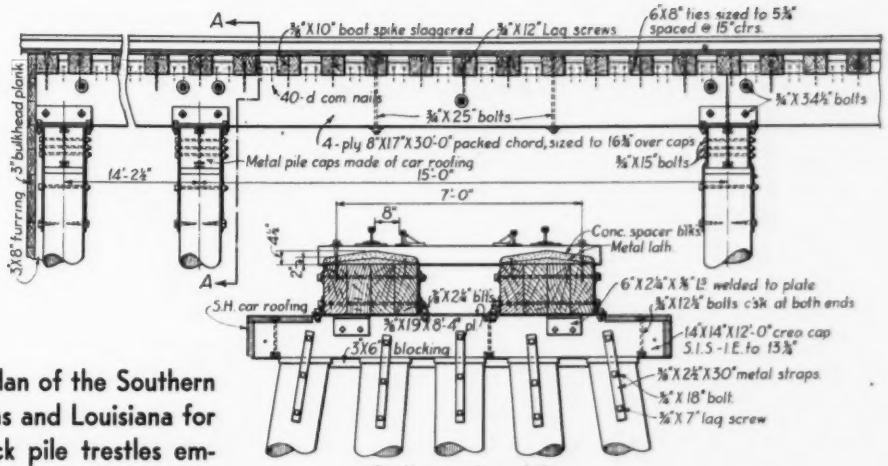
Power equipment has been an important aid in such work. Cranes are a big help in handling heavy material. Their use also reduces the cost of picking up dirt and rubbish in cleaning the yard and is an important factor in reducing work-train expense. Power rail drills are especially helpful in rail renewals in yards. In these construction projects, as well as in routine maintenance that requires work on lead tracks, the section foreman should confer with the yard master with a view to the selection of a time for the work when the traffic is lightest, since he can do his work at such time with less delay to his gang or to traffic.

The distribution, ordering and conservation of material are important factors in terminal maintenance. When ordering the necessary fastenings for any one of the many weights of rail to be found in any terminal, one should exercise care in checking every item to avoid a surplus in one item or a shortage in another. With a minimum stock for emergency use, one can keep it more orderly and know just what he has on hand. When he orders a large quantity of material for a certain location, it is used there and not allowed to lie around. The foreman should not request material monthly, but as he needs it, and unless the supervisor knows about how much material the foreman has on hand, he should not approve a request until he has made a check in the field. In our own practice, one copy of a requisition is sent to the foreman and another filed in the roadmaster's office, and when the foreman receives the material he receipts his copy of the requisition and returns it to the roadmaster's office. This system, plus a checking of all orders against those previously received, precludes duplications.

Effective terminal maintenance demands close contact between the foreman and the supervisor, to the end that the latter shall receive the benefit of the supervisor's advice and suggestions in planning his work and in applying the most effective methods. There is, however, ample opportunity for the foreman to exercise his own initiative and ingenuity in a way that provides an effective measure of his qualifications for the position. Whereas the main line foreman may be judged largely on the riding quality of his track, the yard foreman's ability can be checked by the amount and quality of work he does, the cleanliness of his yard and his record for derailments.

HOBOS IN RUSSIA—Damage to tracks and cars by hobos, reported from many portions of Russia, has moved the council of the people's commissars and the central committee of the communist party to issue an order to imprison for six months all persons caught stealing rides on trains. Vagrants who deliberately damage railway property may be imprisoned for three years.

This Trestle Is Different



Section on line A-A.

Elevation and Section of the New Standard Open-Deck Pile Trestle

The new standard plan of the Southern Pacific Lines in Texas and Louisiana for creosoted open-deck pile trestles embodies many unusual features. Outstanding among these is the hardware for the cap, which is designed to increase the bearing area for the chords, minimize checking, provide improved connections to the piles and the chords, and decrease the fire hazard.

TO the increasing number of railroads that have recently revised their standard plans for creosoted open-deck pile trestles must be added the Southern Pacific Lines in Texas and Louisiana, and while this road, like the others, had for one of its objectives a greater facility in the preframing of the timbers before treatment, the plan evolved embodies many features not included in the new designs of other roads. In fact, some elements of the Southern Pacific plan comprise marked departures from generally accepted practices, with the result, according to officers of the road, that the design possesses the following advantages:

(1) A minimum of exposure of the timber to the effect of weathering.

(2) A minimum of exposure of the timber to cinders or other hot or burning objects, dropped from locomotives or cars, or by pedestrians, that tend to start fires.

(3) Complete framing and boring before treatment, except for the holes in the piles that are required for fastening the caps and sway braces to them.

(4) The absence of vertical drift pins in both the stringers and the caps, experience having been shown that the holes for these drift pins serve as the focus of serious decay.

(5) A saving in timber, due to the use of shorter ties and the elimination of the outside guard rails.

(6) A longer life for the caps through the introduction of some novel means of increasing their resistance to deterioration.

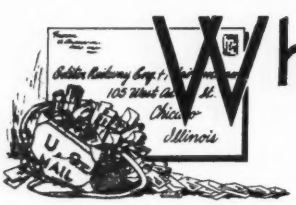
In brief, the plan calls for five-pile bents with 14-in. by 14-in. by 12-ft. caps, spaced 15 ft. center to center; four ply chords of 8-in. by 17-in. stringers, packed solid and continuous over two panels, with butt joints staggered; 6-in. by 8-in. by 8-ft. ties laid flat and spaced 15 in. center to center; and inside guards of second-hand rail instead of outside guard rails. A similar design with six-pile bents is used where conditions warrant. One outstanding feature of the design lies in the fact that except for the tops of the ties, no horizontal timber surface is exposed. The tops of the stringers between the ties are covered by concrete spacing blocks, while the tops of the caps and the tops of the piles are covered with metal.

Special thought was given to the cap, which has long been the vulnerable element in pile trestles. To eliminate vertical drift-pin holes, it is fastened to the piles by means of metal straps. 2½ in. by ⅜ in. by 30 in. long. These are attached to the cap on each side by ¾ in. bolts in prebored holes and to the pile by one ¾-in. through bolt and two ¾-in. by 7-in. lag screws, one on each side in the bottom holes at the two straps. However, the most unusual feature is the application of a metal plate to the top of the cap, extending from the outside of one chord to the outside of the other, this plate performing the double function of providing a better bearing for the stringers on the caps and affording the means of securing the chords to the caps. This plate is ⅜ in. by 19 in. by 8 ft. 4 in., the excess width over the 13¾-in. sized width of the cap providing a greater bearing area and also affording sufficient overhang to permit two 6-in. by 2¼-in. by ⅜-in. angles, 12 in. long, to be welded on each side near the ends (with the long legs down) for the purpose of providing a fastening to the caps by means of two ¾-in. bolts at each end.

Measures to Minimize Checking

The chords are connected to this plate by means of 6-in. by 4-in. by ⅜-in. angles, 19 in. long, held against the outside and inside stringers by ¾-in. chord bolts and secured to the plate by ⅞-in. bolts. The bolt holes in the plate for the outside connections are 15/16 in. in diameter, while those for the inside connections are slotted to allow for variations in the packed width of the chords. As shown on the drawing, these various connections call for eleven horizontal holes through the cap, which provide a high degree of resistance to checking. These bolts are supplemented by three vertical bolts, two near each end and one near the center, which were introduced solely to minimize checking. The holes

(Continued on page 496)



What's the Answer?

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions that you may wish to have discussed.

To Be Answered in November

1. *Is a lower standard of tie inspection warranted for passing sidings and other side tracks than for main tracks? If so, how should this standard compare with that for main tracks?*
2. *What measures are necessary to prevent the introduction of air into suction lines?*
3. *Should flanger signs be erected at all turnouts, grade crossings, bridges, insulated joints, etc., or only at obstructions where there are no other identifying signs? Why? Is there any advantage in maintaining permanent flanger signs in territory subject to heavy snowfall? Why?*
4. *Where rivets have become loose, what details should be given special attention when replacing them? Why?*
5. *Is there any advantage in loosening the bolts slightly at joints upon the approach of cold weather, to permit contraction of the rails? Why? If not, what means can be employed to insure the maintenance of uniform expansion gaps?*
6. *Can creosoted lumber be painted? If so, how?*
7. *What details should be given special attention in maintaining railway crossings? What is their relative importance?*
8. *How should one go about renewing a cap in an open-deck pile trestle? What precautions should be observed?*

Selecting Joints for Welding

Is the selective or out-of-face method preferable for building up rail joints by welding? What considerations determine this?

Condition of Rail Decisive Factor

By F. S. SCHWINN
Assistant Chief Engineer, Gulf Coast Lines, Houston, Texas

This is a question that can be answered only in the light of a full knowledge of the condition of the rail to be reconditioned. If it is found that all of the joints require the building up of the rail ends, then the work should be done out of face. If, on the other hand, only occasional joints need such attention, then they should be selected and built up accordingly. Where the rail ends have less than 0.045 (3/64) in. batter, nothing can be gained by welding. It has been our experience that many joints which apparently have more than this amount of batter, actually do not have enough batter to warrant the expense of rebuilding them.

Before the rail ends are built up, the joint should be put in good condition, all bolts should be tightened properly and the angle bars should have proper contact with the rail. The joints should be brought to surface and be well tamped. If necessary, clean ballast should be applied under the joint ties. If the old rail and joint bars are badly worn in the fishing, the joint bars should be replaced with reformed or oversized bars. It has been our experience that where reformed bars have been applied to such rail, from 60 to 75 per cent of the rail ends are not sufficiently battered to require building up. For this reason, unless proper attention is given to the joint conditions before the rail ends are built up, much of the benefit is lost, that should be realized from building them up. On the other hand, if the necessary attention is given to the several details that have been mentioned, the amount of rail-end welding that is required will be minimized and the results obtained will be improved.

Apparent Batter Usually Less Than Actual

By Assistant Engineer Maintenance of Way

When we began to recondition our rail ends by welding, the practice was yet in its infancy and little information on the subject was available. As a result, much of the early work we did was somewhat in the nature of an experiment. Since an inspection prior to our first job of welding indicated that a considerable degree of batter had occurred at practically all of the joints, the work was done out of face. Preparatory to welding, however, the track was surfaced and the bolts were tightened, but no other work was done.

We continued this practice for several years, sometimes employing the selective method where the rail appeared to be in better condition. At this time neither surface nor cross grinders were used, the new metal being smoothed down with flatters. Eventually we discovered that we were not getting all of the benefits we had expected from the welding and began an investigation to find out the reason.

One of the first things we discovered was that where there was apparent batter, there was almost invariably considerable wear on the fishing surfaces between the joint bar and the head of the rail, this wear being greatest on the receiving end of rails in double track. There was usually less difference on single track, since the ends of these rails take traffic in both directions and the ends both deliver and receive the wheels in moving trains.

Our first action was to reverse the joint bars. Although we had expected some improvement, we were greatly surprised to find that when the track had been surfaced and the bolts tightened, much of the apparent batter had disappeared. Our next step was to use reformed bars, and while this was an improvement, the reconditioned bars did not wear uniformly. We are now depending almost entirely on reversing the bars and inserting the new type of joint-bar shim which has a cut out at the rail gap.

This practice has by no means eliminated the necessity for rebuilding the rail ends by welding. It has, however, reduced the amount of welding that was done formerly,

much of which we now know was wasted effort. In other words, where true batter occurs, the need for rebuilding the ends of the rail is as great as before, in order to prolong its service life. On the other hand, much of what we formerly believed to be batter was in reality wear on the fishing surfaces, and poor surface of the rail at the joint.

At present, as batter becomes apparent, we examine the track carefully, make the corrections as described and, if true batter is present we find that selective welding is all that is required. It is possible, of course, to allow the rail to run until out-of-face welding becomes necessary. If it is given the attention it should have, however, it is our experience that selective welding at intervals, the length of which will depend on the volume and character of the traffic, will keep the rail in good condition for a much longer time than out-of-face work where it does not receive this attention, as outlined.

Good Maintenance Reduces Welding

By L. G. BYRD

Bridge and Building Supervisor, Missouri Pacific, Poplar Bluff, Mo.

If it is desired to maintain smooth-riding track, the out-of-face method should be followed, particularly where batter has progressed to the point where 50 per cent or more of the joints require reconditioning. Experience has shown, however, that in some cases, especially where the joints have been maintained in good condition at all times, very little reconditioning is necessary. This applies specifically to track in which the ballast is clean and of good quality, where a good surface has been maintained and the bolts have been kept tight.

In general, the amount of material required to accomplish the reconditioning will vary with the amount of attention or lack of attention the joints have received. It is seldom economical to select joints for welding when the batter is less than 3/32 in., since the labor cost is relatively higher than when the batter exceeds this amount. Again, in selective welding there is relatively more time lost in moving from joint to joint.

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Protecting from Corrosion

Where a solid bridge floor of steel-plate construction is subject to brine drippings, what methods can be employed to protect it from corrosion?

Waterproofing Is Best Method

By Division Engineer

I recall two cases in point, in each of which the deterioration from brine drippings on long span bridges was unusually severe, owing to the large volume of refrigeration traffic. We tried every kind of paint that gave promise of some measure of protection, but all were found to be equally worthless, even though the plates were cleaned and painted twice a year. We then tried coal tar, but the film ruptured, particularly in cold weather, and the corrosive action seemed to be accelerated at the cracks in the film. We also tried an application of asphalt applied with a spray gun. While this lasted somewhat longer, it was not effective. We then applied a film of asphalt and a protection of asphalt mastic. This was the least satisfactory of all of our experiments. Finally, it was decided to try a built-up waterproofing, using felt and fabric, with an asphalt primer and moppings of asphalt, and an asphalt mastic protection, the latter being fluxed to a relatively soft consistency.

This proved so satisfactory on the first structure that it was applied to the second one, with the result that for a number of years no maintenance was required. Eventually repairs to the waterproofing became necessary, but over the term the total cost was less than before.

Is Using Wrought Iron Plates

By Engineer of Bridges

We have never found any method that will give entirely satisfactory protection under the conditions specified. For many years we relied on frequent painting. Then when ballast floors came into use we could only apply paint at the time of erection and hope that corrosion would not be too severe after the paint had failed. Recently, we have erected several relatively short spans with ballasted floors on solid-plate construction in which we have used wrought iron plates. These have not been in service long enough to permit final judgment on their performance, but so far, our reports indicate that they are likely to be superior to steel plates.

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How Many Jacks?

When applying ballast or surfacing new rail, how many jacks are required? Why? How should they be placed? How close to the jacks should the tamping progress before they are moved forward?

Should Not Tamp Closer Than One Rail Length

By HENRY BECKER

Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

It has been my experience that, except for heavy lifts, two jacks are sufficient. They should be set as straight as possible to minimize the amount of lining that is necessary. This is also particularly important in hot weather to avoid buckling. I prefer to keep the tamping back one rail length from the jacks, as I find it is easier to obtain a smooth surface when this is done, there being less danger of springing the quarters.

Depends on Size of Gang

By C. H. CALES

Extra-Gang Foreman, Chesapeake & Ohio, Hinton, W. Va.

In general, the number of jacks will depend on the size of the gang. If the work is being done by the section force with a relatively small gang, four jacks will be enough. For larger extra gangs, six jacks should be used. Six jacks are more desirable at all times so far as the surfacing itself is concerned, but a small gang cannot handle this many and keep the track safe for the passage of trains that are not scheduled. In other words, there may be too much delay to trains while preparing the runoff, as it will be necessary to flag them to a stop. On the other hand, there will be enough tampers in a large gang so that the preparation of the runoff will be a matter of moments only.

Six jacks permits the raising of a sufficient length of track to insure a good surface. At the same time there is not enough unsupported track at any time to create a hazard from buckling. The jacks should be placed at the joints and centers. Occasionally it will be necessary to

raise a quarter as well, but this will seldom interfere with the progress of the work. Tamping should keep up with the jacks, including one face of the ties immediately ahead and behind the jack to insure against the track settling when the jack is removed.

From Two to Eight Jacks May Be Required

By ROBERT WHITE
Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

Under normal conditions of surfacing, two jacks, placed first between the second and third ties ahead of the joint, and opposite each other, is enough. Where the unloading of the ballast is heavy, however, the best results can be obtained by using four jacks. Where four are used, they should be kept one-half a rail length apart, but the leading jacks should not bring the track up to full surface. They are used primarily to take the strain off the rear jacks. After the rear jacks have brought the track up to surface, they are moved ahead, the leading jacks then being the rear pair, to take the strain while the others bring the track to surface.

Where a lift of six inches or more is required, six or even eight jacks can be used to advantage if the gang is a large one. In my experience it is never necessary to use more than two jacks for lifts of three inches or less. Up to six inches, four should be used. On higher lifts, speed is a factor and the work will progress faster because of the larger number of tampers. Except for the jack tampers, no tamping should be done within one-half rail length of the jacks.

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Motors or Diesel Engines?

What are the relative advantages and disadvantages of electric motors and Diesel engines for pumping water for railway use?

Local Conditions Determine Type

By J. B. WESLEY
Engineer Water Service, Missouri Pacific, St. Louis, Mo.

Considering units of equal power rating, the electric motor is smaller than the Diesel engine. It requires, therefore, a smaller space for installation, while lighter and less expensive foundations are needed; also it can be housed in a smaller building. The net result is a smaller installation cost. The motor is particularly flexible with respect to operating control. For this reason, it can be connected for manual control, control from some remote point, or it can be made fully automatic in operation. The full automatic control, set to maintain a predetermined level of the water in the supply tank, is of particular value in warm climates, especially where wooden tanks are used, as the tank can be kept full to prevent the staves from drying out and causing leaks. Electric motors have three principal disadvantages: (1) Electric power is not yet available at many points; (2) there is risk of interruption of power service; and (3) the power cost of operation may be high.

Diesel engines possess the main advantage of low operating cost. A Diesel engine can be located anywhere, without regard to outside connections; the power unit is completely under the control of the operator; and the maintenance is rarely so intricate as to require the services of a specialized mechanic. Among the disadvantages are high first cost of the power unit; heavy foundations are required; and a large space is needed for the installation. The engine is manually controlled, thus requiring an attendant to start and stop it. Attendance is also desirable while the unit is in operation, but this is not absolutely necessary. This latter feature is not a disadvantage at a plant where the water is treated or other considerations make the presence of an operator necessary.

In general, electric motors cost less and may be operated automatically, but have high operating costs. The Diesel engine is more expensive to install; the power unit is completely under the operator's control and the operating cost is low. Full consideration should be given to these characteristics and their relations to local physical and operating conditions before a decision is made as to which type of power unit is to be used.

Motors Generally Have the Advantage

By GEORGE L. DAVENPORT
Assistant Engineer, Atchison, Topeka & Santa Fe, Los Angeles, Cal.

Obviously, where electric power is not available, motors cannot be used. It is possible, however, that the necessary current might be generated by a Diesel engine, but in most cases the direct application of Diesel power will be more efficient. Assume a well in which the water level is low, say 600 ft. below the surface, and the well, which is not too straight, extends to 1,000 ft. In this case an air lift should be used. The compressor may be either motor or Diesel engine driven. Two considerations favor the Diesel engine, however, since (1) a large amount of power is involved and electric costs will be high unless rates are very low; (2) it is necessary to have an attendant to care for the compressor so that no labor saving can be made by making the plant automatic. Careful analysis might, however, show a preference for electric drive, owing partly to the superior reliability of motors, which might require a comparison between a single-unit, motor-driven compressor plant and a double-unit Diesel plant.

Assume now a shallower lift, say 150 ft. from water level to tank. This well is straight and has ample diameter for a turbine-centrifugal deep-well pump. Electric drive calls for the conventional hollow-shaft motor. An electric switch in the tank will permit automatic operation and eliminate attendance.

Under the same conditions the Diesel engine is at a disadvantage. Either a quarter-turn belt, with or without idler pulleys, or a right-angle direct-geared drive may be used. An attendant must be on hand during the operation of the plant, while maintenance costs over a term of years will probably exceed those of the electric drive. If electric rates are too high, they may more than offset the saving in labor resulting from automatic operation. Usually, however, the advantages of electric operation are so great that a considerable price differential will be tolerated.

As a third assumption, consider a shallow lift within suction limits, which calls for a horizontal centrifugal pump. The same comparison between automatic and manual operation should be made, keeping in mind that motors up to 100 hp. have been operated for years under float-switch automatic control. Even where an attendant is necessary for other reasons, most engineers will recommend direct-connected, motor-driven pumps instead of direct-connected, belted or geared Diesel drive.

In recent years there has been a trend in some fields to the substitution of small Diesel engines for electric motors. Such changes are often based on misinformation with respect to maintenance costs and reliability, which is not founded on actual cost data and statistics.

A motor which is properly protected by standard electrical devices to prevent overload, will operate with practically no maintenance for 20 years or more. No Diesel engine can truthfully claim a similar record. Any comparison between these two power units must include the larger fixed charge involved in Diesel drive, a factor that is sometimes underestimated.

If rates are abnormally high, and no reduction can be obtained, it may be found that there are optional schedules and that by changing to one of these a substantial saving can be made with no change in equipment. At other points, high standby rates may lead to the consideration of smaller motors operating for longer hours to reduce the total power cost.

In general, Diesel engines should be confined to locations where electric power, at least low-rate electricity, is not available. Again, they are best suited to fairly large units, say from 80 to 200 hp., since at important pumping plants more experienced attendants are employed and better care is taken of the more complicated machinery. Usually a higher rate of pay is granted to Diesel engine attendants than to electric-plant attendants.

Where Diesel engines are employed, they must be supplied with carefully specified fuel and lubricating oils. Only a few of the largest oil companies can be relied upon for advice as to these important items, and even then there is nothing better than a correct specification rigidly enforced.

Poor cooling water ruins many Diesel engines. Closed systems of distilled water, or water softened with zeolite with a tower-cooled circulating system, should be used where water contains much incrusting material. With proper care and maintenance, Diesel engines will give long and satisfactory service, but there are few locations where their use is justified, provided dependable electric power is available at a reasonable rate.

Electric Operation More Convenient

By E. M. GRIME
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Presumably the intended comparison must be between electric motors and the medium-pressure, or so-called semi-Diesel type of engine, using the cheaper grades of fuel oil. Old-type gasoline engines, thousands of which still remain in use at small railway pumping stations and which have been equipped with devices for pre-heating the oil before it enters the cylinder, may also be included, since in many instances they demonstrate an economy about equal to that of the more recent semi-Diesel type.

Electric-motor characteristics range about as follows: They are simple in operation; they are reliable when the power is dependable; they are adapted for automatic operation; they require minimum floor space; they are noiseless in operation and are subject to very little vibration; the first cost is low and they have long service life; they are adapted particularly for the operation of turbine and centrifugal pumps.

Electric motors have the following disadvantages: When repairs are necessary, a high-class technician is required; they must be located above high-water elevation to insure against damage during floods; they may be put out of commission by wind storms which damage power lines or other wire connections; they can be used only where power lines are available in the near vicinity of the plant.

Among the advantages of the semi-Diesel-type engines are: They provide an independent source of power; repairs can usually be made by an ordinary mechanic; they are the most economical type of power unit, unless electricity is available at low rates. They have the disadvantage, however, of noisy operation; they give off disagreeable and rather dangerous fumes; and they are something of a fire risk. For use at the ordinary railway pumping station these are not serious disadvantages, the principal one being that of high first cost as compared with the electric motor.

Electric power can be produced in quantity by large-sized full Diesel units, by efficient steam units or by water power, and sold at a price per horsepower that is less than equivalent power can be produced with the ordinary small semi-Diesel pumping plant unit, considering the attendance usually required. As a rule, electric power is the most convenient for all purposes. Hence, the ultimate decision as to the type of power to use will depend on the availability and the purchase price of electricity.

Each Has Its Own Field

By Supervisor of Water Service

Both electric motors and oil engines of the semi-Diesel type have advantages and disadvantages for pumping railway water supplies, and if properly used, each has its own field, so that a direct comparison between the two is difficult to draw. The electric motor is especially adapted for automatic control, while the first cost is usually less than for an oil engine of equal power capacity. The motor is cleaner and quieter in operation than the oil unit, requires less floor and vertical space, especially where the pump and motor are directly connected.

Oil engines have the advantage of lower power costs and, owing to the fact that they are prime movers, they are independent of power lines, transformers, etc. They are, therefore, not subject to interruptions as a result of storms and other causes which often interfere with transmission lines.

Each has its own field, however, and nothing in the foregoing is intended as a criticism of either type of unit. The selection of the particular type for any installation is usually fixed by conditions at each particular station, so that in general there is no competition between the two types.

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Oiling the Fishing Surfaces

When laying rail, should the fishing surfaces be oiled before or after the rail is set in the track? Why?

Prefers to Oil Before Rail Is Set in Track

By Supervisor of Track

I am very definitely in favor of oiling the fishing surfaces when laying rail. It has been my experience that this can best be done before the rail is set in. There are several reasons for this. Where the oiling is done after the rail is placed, there is enough interference to slow down the work. I am aware that in many quarters this is not considered a valid objection since the oiling can be done after the rail crane has moved over the joint.

We find, however, that we can lay more rail in a given time if the joint bars are hung on the rail before it is picked up. Obviously, this requires that the oiling be done while the rail is still outside of the track. Another objection sometimes advanced is that too much labor is required to turn the rail in position for oiling. We find that less time is required to pick up a rail that is turned workway, in fact, the labor of turning is more than offset by the time saved in laying the rail. For this reason, we turn the rail regardless of when the oil is to be applied,

so that the labor in question is not considered as part of the oiling operation.

Perhaps the most serious objection to oiling ahead of the laying is that particles of ballast and other debris will cling to the oiled surface. It has been our experience that with ordinary care in placing the tongs and by the craneman in lifting, the rail remains in a horizontal position as it is being lifted and this trouble seldom occurs. In the relatively few cases where it does, it takes only a moment to remove the foreign matter.

Oils After the Rail Is in the Track

By W. O. DENNIS
Inspector Maintenance of Way, Lehigh & New England, Bethlehem, Pa.

In oiling the fishing surfaces of the rail, three important objectives are accomplished. In the first place, the scale is removed and the application of oil aids in giving a better fit to the joint bars; second, the oil tends to retard corrosion; and last, by reason of the oiling, the surfaces of the rail and joint bar are free to move relatively, with the result that this aids in preventing frozen joints.

Having these features in mind, the fishing surfaces should be oiled only after the rail is set into the track. If oiled while along the track before it is picked up for setting in place, considerable extra labor is required to get it into position where it can be oiled properly. If the oiling is done while the rail is still outside the track, a considerable part of the oil will run off and be wasted. Oiling at this time also allows foreign matter to adhere to the oiled surface, which is quite detrimental since this will interfere with getting a good fit between the rail and the joint bar, which, it is unnecessary to say, is essential.

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Improper Use of Shovels

In what ways are shovels used improperly? What measures can be taken to correct these practices? How should they be used?

Constant Supervision Will Correct Misuse

By J. B. KELLY
General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis, Minn.

The track shovel is the most universally used tool for track work and is, therefore, most readily available under ordinary conditions. Its light weight in comparison with other tools assures its presence and invites its use for purposes for which shovels were never intended. One of the most aggravated forms of misuse is that of nipping ties that are being spiked. As a rule, shovels are used only occasionally for this purpose, but often enough to make it desirable to emphasize the fact that they should never be used in this way. When misused in this manner, there is every likelihood that the tool will be damaged beyond the possibility of repair.

In the operation of removing and inserting ties, for which picks and tongs should be provided, it was formerly the quite general practice to use the shovel, swinging it with sufficient force to embed the corner in the tie so that it could be pulled out of or into the track. The progressive movement of the tie in each operation necessitated the resetting of the shovel blade two or three times before the tie was removed or inserted. The result was that the service life of the shovel was definitely reduced through breakage of the handle straps and the top of the blade. While this practice has not been entirely stamped out, it is far less common than formerly.

When used in the ordinary way for the purposes for which it is designed, such as handling earth or ballast and for tamping, the life of the shovel can be prolonged until the blade is worn so short as to unfit it for further use. Relief from the forms of misuse to which shovels are subjected can be obtained only by continued insistence that they shall not be substituted for bars when nipping ties, or used instead of tongs when removing or inserting ties.

Three Principal Forms of Misuse

By WILLIAM RYAN
Track Supervisor, Baltimore & Ohio, St. George, Staten Island, N. Y.

In common with other supervisory officers, I have observed many instances of improper use of shovels. Three forms of misuse are quite likely to damage shovels beyond the possibility of repair. I consider the most aggravated of these to be the persistent habit of striking the corner of the shovel blade into ties to pull them out of or into the track. Another that is equally bad is the use of shovels to hold up ties while they are being spiked. The third, not so often mentioned, is that of placing the shovels in the tool box first and then throwing jacks and other heavy tools on top of them.

To remedy these improper uses, the foreman should be supplied with tie tongs and should insist that they be used when removing or inserting ties. Likewise, lining bars should replace shovels for nipping ties. And finally the foreman should be held responsible for putting heavy tools in the tool box first and the shovels last.

Cost of Tools Should Be Considered

By W. E. TILLETT
Assistant Foreman, Chesapeake & Ohio, Maysville, Ky.

A shovel is one of the handiest tools used for track work and because it can be applied in so many ways, there is always a tendency on the part of the men to pick it up and use it in place of the heavier tools that are designed for these varied purposes. For this reason, it requires the most constant effort on the part of the foreman, even where discipline is otherwise well maintained, to prevent misuse of shovels. Among the ways of damaging them are their use for pulling ties, for nipping ties, for prying up crossing plank and other heavy objects, and for digging into hard ground where picks should be used. When the blade is struck into a tie, the tie is certain to be damaged and the shovel is quite likely to be.

One approach toward correcting these forms of misuse is to interest both foremen and men in what it means in the way of cost when tools are damaged, and to impress them with the needless waste that results from their carelessness, for, generally, the trouble comes from carelessness or thoughtlessness.

Should Be Used So They Will Wear Out

By L. G. BYRD
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Probably no improper practice is so difficult to stamp out as the misuse of shovels. The track shovel is a light and handy tool that is almost always near at hand, and it can be used for so many purposes that it is quite natural that the men should pick it up rather than spend the time necessary to go for the proper tool. Nipping ties and using the shovel to pry other heavy objects usually

causes failure through breakage of the handle. Its use for removing or inserting ties is quite likely to break both blade and handle. When it is used in place of a pick, the damage may be equally severe. The correction of these improper practices is entirely a matter of supervision which is in the hands of supervisors and foreman. The service life of a shovel that is properly used is measured by the time it takes the blade to wear out; if used improperly, it may be a matter of only days or weeks.

Should Be Used Only for Designed Purposes

By H. E. HERINGTON

Section Foreman, Minneapolis & St. Louis, Jordan, Minn.

Shovels should never be used for purposes for which they are not designed. As a matter of fact, it requires the most constant and alert attention to prevent their misuse. Partly because of their light weight and partly because they are generally the most readily available tool, they are used to drag in or pull out ties, to nip for spiking, in place of bars for prying, to break up hard soil where picks would do the work more easily and quickly, and when unloading rails from flat cars instead of bars or railforks. Only by providing tie tongs, bars, picks, rail forks, etc., and by a complete insistence on their use can these forms of misuse be stopped. This is directly up to the foreman and, indirectly, to the supervisor.

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What Kind of a Gutter

What are the relative advantages of wood, copper, tin and galvanized gutters? Should they be painted? Why? If so, what kind of paint is most suitable for each?

Architectural Requirements May Govern

By General Inspector of Buildings

In many instances, gutters have been applied to buildings from which it would have been better to omit them. Obviously, however, in sections where water running off the roof may freeze on walks or platforms, gutters are a necessity. In such cases, while they may be of any of the materials mentioned, the architectural features of the structure may be of the deciding factor in the selection.

It is my observation that, considering first cost, service life and maintenance, wood gutters of cypress or fir are the most economical. They are adapted particularly for buildings of moderate size because of their somewhat limited carrying capacity, one attractive feature being that expansion and contraction do not enter into the problem of maintenance. This type is the most durable for severe exposures to cinders and locomotive gases.

Copper gutters should preferably be used with the permanent types of roofing, such as tile, slate and asbestos shingles. This type requires adequate provision for expansion, however, without which it may be entirely worthless.

Tin as a gutter material is particularly desirable for use on tin roofs. It can sometimes be used to advantage with other classes of roofing, but cannot be expected to give the service life that is obtained from wood or copper. Seams in both tin and copper gutters should be locked and soldered. Tin is so easily distorted that it requires almost continuous support, and for this reason is not well adapted for hanging gutters.

Galvanized sheets are adapted especially for use where a low-priced gutter is desired, but the life of this material is shorter than that of the other types mentioned. Ordinary grades of steel should not be used, however, as they will not last. Pure iron or copper-bearing steel will usually give satisfactory service, provided the galvanizing is well done and the coating is not ruptured in forming the gutters.

Wood gutters should be painted inside and outside at the time of application, using any durable paint. The priming should be well done with a paint having a lead base. Repainting is required at intervals of three to five years. Copper gutters should be given a coat of linseed oil, which should be repeated from time to time. Iron-oxide paint should be used on tin surfaces. There is no necessity for painting galvanized gutters for one or two years, after which they should be kept well painted. The priming coat should be red lead in linseed oil and this should be protected with any durable paint.

Gutters Can Sometimes Be Omitted

By G. A. BELDEN

Architect, Central of Georgia, Savannah, Ga.

This discussion is based on an experience of many years which has been limited chiefly to southern territory where snow and ice are not factors in the selection and relative merits of the gutter materials under consideration. Gutters made from solid sections of cypress and fir have generally given satisfactory service when kept properly painted. They were adopted as standard for ordinary combination depots by the Central of Georgia a number of years ago, and gutters of this type which were applied as long ago as in 1913 and 1914 have not yet required renewal.

This type of gutter is strong and rigid and provides an ornamental eaves finish. The first cost is greater than for galvanized metal but less than for copper. The sizes available are limited, but the range is sufficient for most ordinary depots and other buildings of similar importance. In making the application, careful attention must be given to such details as mitred joints, closed ends, outlets for conductors, splices, etc. The best results are obtained when the gutters are attached to the building with brass screws. When first erected, wood gutters should be painted with lead paint in linseed oil, three coats being required for best results. Subsequently, they will require painting about every five or six years.

From the standpoint of low maintenance, copper is an ideal material for hanging gutters and eaves troughs that hang clear of the walls of the building. Such gutters should be made of cold rolled or hard copper, more properly designated as "cornice temper," and should be so supported and tied as to avoid sagging and distortion. Expansion and contraction should be provided by means of slip joints. The use of copper for lining built-in gutters, especially those back of parapet walls, where the gutter lies inside of the walls of the building, can be recommended, on condition that some means can be provided for caring for expansion and contraction. Where copper is used in this way, it should be of the grade known as "roofing temper," which is relatively soft.

In two instances known to the writer, copper gutter linings which had been installed by experienced roofers, have developed numerous leaks as a result of the failure of the expansion joints to function properly, causing the copper to break. Unless the expansion and contraction are properly provided for, the advantages obtained by the permanent nature of the material will be more than offset by the troubles resulting from the copper breaking.

There appears to be no advantage in painting copper gutters. In fact, it is not certain that the paint will ad-

here to the metal, even after all of the conventional precautions have been taken.

When used as lining for built-in gutters in connection with a tin roof, tin will give good service if it is kept protected by paint. Since tin sheets come in small sizes, it is not suitable for hanging gutters or eaves troughs, in addition to which the metal is not strong enough to be used without a continuous support. Tin gutters made from IX sheets, laid with flat-locked and soldered seams, have been satisfactory, but require painting at intervals of not more than three years. A good grade of paint, consisting of iron oxide in pure linseed oil, appears to give the necessary protection at reasonable cost.

Galvanized gutters meet a wide range of requirements at reasonable cost. For best service, gages lighter than No. 26 should be avoided. The heavier gages will prove to be more economical in the end. The comparative durability of the pure irons, copper-bearing steels and ordinary steel can best be determined by actual use, provided the conditions of exposure are about the same. It is the opinion of the writer, based on actual exposure tests, that copper-bearing steels will give satisfactory service, provided the galvanizing is good and has not been broken in forming or handling.

Eaves troughs, roof gutters and box gutters of galvanized metal should be sufficiently heavy and so supported that they will not sag or become distorted under the weight of the water that they will be required to carry. Where the gutter is in a long run, provision should be made for expansion and contraction. It should be well graded toward the conductor outlet, so that cinders will be washed out of the gutter during rains.

Unless it is necessary to conform to some architectural color scheme, there appears to be no necessity for painting galvanized gutters, so long as the zinc coating is intact. When this coating begins to wear off, the life of the gutters can be extended for many years by painting with any good metal paint. My preference is to use red lead and linseed oil as a priming coat for worn galvanized sheets, over which the regular standard colors can be applied.

Before closing this discussion, it might be well to suggest that in some cases the question of gutter maintenance can be solved economically by eliminating the gutters. In several cases where gutters required renewal, we have found that they were serving no useful service and have removed them.

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Fire Protection for Bridge Ties

Is the use of metal sheets over the ties of open-deck bridges an effective method of fireproofing? What are its limitations?

Finds This Form of Protection Effective

By FRANK H. CRAMER

Assistant Engineer of Bridges, Chicago, Burlington & Quincy, Chicago

It has been our experience that the form of protection suggested in the question is quite effective. With proper maintenance of the metal sheets, those fires which it is intended to protect against are eliminated, and real protection is afforded to traffic, especially where the bridges are of considerable length or are located on blind curves.

Because they are economical in both construction and maintenance, it seems likely that wooden trestles will continue to be used for many years, where the question of permanency is not a ruling consideration. Two classes of decks for trestles of this construction are now in common use and will likely continue in favor. These are (1) ballast decks, which of themselves largely tend to eliminate those fires which start from above; and (2) open decks, which are inherently a potential fire hazard. The former can be eliminated from consideration as it is on the latter that metal sheets offer an opportunity to reduce the fire hazard.

It should be observed that the effectiveness of this form of protection depends in large measure upon the method of application and on proper maintenance. In applying, the sheets should be lapped a sufficient amount to insure against the entrance of hot coals where the several widths adjoin. This should be done over both the ties and the guard rail. First, a sheet of proper width is placed directly under the rail, so that the edges will extend beyond the rails, to avoid longitudinal laps under the rails. The remainder of the sheets are then laid with 2-in. laps, those covering the guard rail being bent in the field to form a close fit over this timber.

Care is necessary in selecting the right type of nails for fastening the metal sheets. When we first adopted this form of protection, a standard 2-in. common nail was used for this purpose. In a relatively short time, the vibration in the structure caused an enlargement of the holes around the nails and the metal became loose enough to form pockets at the laps between the sheets. This condition was found to be quite hazardous, since it allowed hot coals or sparks to lodge between the metal covering and the timber, as a result of the air currents set up by moving trains.

In many cases the heads of the nails broke off, thus increasing the hazard. Later a galvanized iron washer was used with good results. Even after this was done, however, the nails eventually loosened in the ties and started to come out of the wood, with the same results as before the washers were applied. The loosening of the sheets became quite a maintenance problem and after some study it was decided to use a deeply barbed No. 9 cement-coated roofing nail with a ½-in. head. This has given excellent results and reduced maintenance costs.

Cannot Be Used in Automatic-Signal Territory

By L. G. BYRD

Bridge and Building Supervisor, Missouri Pacific, Poplar Bluff, Mo.

Metal sheets applied over the entire deck, including the guard timbers and extending under the rails, will eliminate the hazard only of those fires which start from the top. This form of protection cannot be used, however, in automatic-signal territory, since the continuous covering of metal will interfere with the track circuits. In my opinion this form of protection is not economical and possesses other objectionable features as well. It increases the hazard to workmen engaged in making repairs; it hides essential parts of the structure in such a way as to make close inspection difficult. Again, in case a fire starts from below the deck, experience has shown that it spreads much more quickly and cannot be confined within as close limits as when the deck is fully open. We have also found that such fires are more difficult to extinguish. It has also been our experience that timber bridges catch fire below the deck as often as from the top.

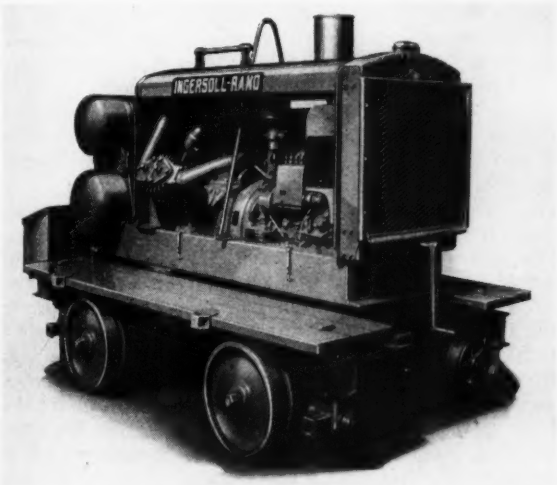
For the foregoing reasons, it is our practice in open-deck construction to apply the sheet-metal protection only over the caps and stringers. Ballast-deck construction affords a better form of fire protection from top fires, and the cost of such a deck is not so much greater as is generally supposed than an open deck with a covering of metal sheets.

NEW AND IMPROVED DEVICES

I-R Compressors Now With Oil-Engine Drive

THE Ingersoll-Rand Company, New York, is now furnishing its portable two-stage, air-cooled air compressors, including tie tamper compressors, with an oil-engine drive, as well as with the gasoline engine drive furnished in the past. The new oil-engine, which is known as Type H, is a four-cycle, solid-fuel-injection, spark-ignition, low-compression engine, which has high torque at reduced speeds, giving it large "lugging" ability. The engine operates on low-cost non-explosive fuel oil, effecting a considerable saving in fuel over the gas engine, and it is said that the exhaust is clean and that the spark plugs do not become fouled readily thereby minimizing upkeep costs.

Unlike a Diesel engine, the Type H unit, with its spark ignition, is started readily by a hand crank, without

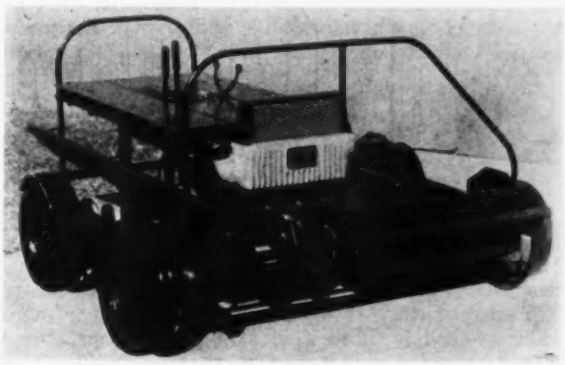


The 125-Ft. Tie Tamper Unit Equipped With the New I-R Type H Oil Engine

warming up, it being necessary only to prime it with a small amount of gasoline. The oil engine occupies no more space than the gasoline engine, and, therefore, can be supplied with the same housing as the tamper units. It weighs more than the gasoline engine, however, and is slightly more expensive initially. The six sizes in which the two-stage, air-cooled portable compressors are furnished, with either the gasoline-engine or oil-engine drive, have capacities of 75, 125, 185, 250 and 370 cu. ft. per min., capable of operating 4, 8, 12, 16 and 24 MT-3 tie tamping tools, respectively.

Fairmont, Inc., Improves Its 59 Motor Car

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has incorporated a number of improvements in its "59" combined work and inspection car which was first introduced in 1931, when it was described in *Railway Engineering and Maintenance*, for May, page 479. The car has now been equipped with lift handles which may



The Improved Fairmont 59 Car

be pulled out a distance of 21 in. at either end and which reduce the pick-up weight at the rear to 101 lb. The car has also been fitted with a water-saving condenser and aluminum hopper which cannot be overfilled. Self-centering, iron-faced brake shoes have been applied to all four wheels of the car, in place of the oak brake shoes that were originally used. These shoes are said to assure emergency stops in the shortest possible time, while maintenance and adjustments are kept at a minimum.

The engine of the car has been mounted on pressed steel channels which are designed to resist base wear and to be kept tight more easily than oak sills with which the car was formerly equipped. A new unit guide-plate has been provided, which affords two locking positions each for the brake and belt levers. This plate also carries a new combined choke and needle valve control button.

RAILWAY QUEEN—Miss Gracie Jones, British railway "queen," and daughter of a Welsh section laborer for the London, Midland & Scottish, has returned home, stating that she was simply overwhelmed by the reception given her by railroaders and railways on this side of the water, including an elaborate presentation at the Wings of the Century show at A Century of Progress Exposition.

What Our Readers Think

Transposing Rail on Curves

Council Bluffs, Iowa.

TO THE EDITOR:

As a further contribution to the discussion on transposing rail on curves, and with particular reference to Mr. Baldridge's letter in the June issue, in which he mentions the disadvantages of transposing the short rails from the inside to the outside of the curve, I have followed a practice which, in large part, overcomes the difficulty which arises from the difference in the length of the inner and outer rails of the curve.

My method is to find and mark all short rails on the inside of the curve. At each short rail, I unload a rail of standard length. When the inside rails are set over to the outside, I discard the short rails, inserting the standard-length rails which have thus been provided, and at the same time cut rails from the outside of the curve to the same length as each of the short rails which have been discarded. This method permits the joints in both lines of rails to come in the exact location which they originally occupied on each side and, in case the joints are slot spiked, eliminates the necessity for spacing ties.

L. DIPPERT
Roadmaster, Chicago & North Western

Wrought Iron Roofing Nails

Albany, N. Y., July 10, 1934.

TO THE EDITOR:

In reading the discussion of the replacement of roofing slate by A. T. Hawk in your July issue, page 387, the following sentence is noted in the second paragraph: "This method is called head nailing and is, or always should be, done with copper nails, this being the only type that will last for a long time."

I have before me several sample lots of wrought iron slating nails. The first lot was taken from a slate roof on our freight house at Wilkes-Barre, Pa., which was erected in 1886, and are in excellent condition. The second lot are nails which were used in the application of a slate roof on our car shops in Green Island, N. Y., in 1876; these are also of wrought iron and were in good condition when removed during 1933. The small nail

Side and Edge Views of Wrought Iron Nail after 75 Years' Service

shown here, is from a lot which were salvaged during the re-roofing of a bridge shop at Carbondale, Pa., during 1933. This nail is still going strong after 75 years' service, as the shop was erected in 1858.

While it is true that Mr. Hawk does not specifically define his meaning of "a long time," these actual records of wrought iron slating nails are very interesting, particularly if one considers the difference in cost of copper and genuine wrought iron for this purpose on a large roofing job.

C. MILES BURPEE,
Research Engineer, Delaware & Hudson.

This Trestle Is Different

(Continued from page 487)

for these vertical bolts are countersunk at the top and bottom.

To complete the protective covering of the cap, provided in part by the metal plate which extends over a length of 8 ft. 4 in., the ends of the caps beyond the plate are covered with second-hand metal car-roofing sheets, fastened with obsolete galvanized tie-dating nails. Both the top and end pieces of this sheathing are bent over to provide flanges two inches wide that extend over the two sides of the cap. This second-hand roofing is used also to provide metal caps for the tops of the piles. Another distinctive feature of the practice with respect to the caps, is that all of the hardware, including the pile straps, is applied to the timber at the treating plant.

The stringers are furnished in 30-ft. lengths, except that half of the stringers in the end panels are in 15-ft. lengths to provide for the staggering of the joints over the intermediate bents. The chords are assembled with the full-length stringers on the outside, except for a half-length stringer in the panel at one end of a bridge with an odd number of panels. Four chord bolts are provided over each bent and one in the middle of the panel. In addition, the outside stringers are bored at the third points of the span for ¾-in. deck anchor bolts, by means of which two ties in each panel are secured to the chords.

Another distinctive feature of the deck is its limited width, as the ties are only eight feet long. This was accomplished by packing the chords and eliminating the outside guard rails. In addition to the deck anchor bolts referred to above, by which two of the ties in each panel are attached to the chord, three other ties are attached by means of ¾-in. by 12-in. lag screws and the remainder by ⅜-in. by 10-in. boat spikes, all of which are driven with staggered positioning into the outside stringers. The concrete packing blocks are cast in place after the ties are laid. They are constructed of high-early-strength cement, sand and pea gravel in the proportions 1-2½-3½, and are 4½ in. thick at the center line of the chord, tapering off to a thickness of 2 in. at the sides. A strip of ⅜-in. copper-bearing metal lath, 6-in. wide by 30-in. long, serves as the reinforcement, while two 40-d nails, driven partway into both the outside and inside stringers before the concrete has been placed, serve as dowels to anchor the blocks to the caps.

As stated previously, all bolt holes except those in the piles are bored before treatment, but the standard plan specifies also that all field-bored holes shall be treated with preservative by means of a pressure device. As a further protective measure, a heavy coat of coal-tar pitch is applied to the top of the caps before the metal covering is placed and to the tops of the stringers before receiving the ties and spacer blocks. This material is also applied over the tops of the concrete blocks after they have hardened.

The Southern Pacific Lines in Texas and Louisiana have built about 4,000 ft. of trestle according to the new design, and a study of material and labor records indicates that the cost is substantially the same as that of the conventional design of trestle. The new design, however, insures maximum life of the treated timber, better protection against fires and an outlet for a considerable quantity of second-hand plates, angles and metal sheets recovered at the reclamation yard.

We are indebted to R. W. Barnes, chief engineer, and E. A. Craft, engineer maintenance of way, of the Southern Pacific Lines in Texas & Louisiana, Houston, Tex., for the information presented in this article.

News of the Month . . .

Railroad Credit Corporation Returns 23 Per Cent

The Railroad Credit Corporation, which was organized for the purpose of making loans to railways from the excess revenues derived from the temporary freight-rate increase of 1931, has now returned to the contributing railways 23 percent of the pooled fund. This amounts to $16,961,370, of which $7,353,891 has been paid in cash and $9,607,479 credited on obligations due the corporation.

Maintenance Forces in July Almost Same as in June

The number of persons engaged in the maintenance of tracks and structures on the Class I railroads in July was 236,422, or 12.18 per cent more than the corresponding figure of 210,748 for July, 1933. It was less by 162 persons than the figure for June of this year. Total employment on the Class I railroads in July was 1,047,977, which was 5.99 per cent more than in July, 1933, and 0.58 per cent less than in the previous month of this year.

Better Control of Highway Traffic in Kansas

Progress toward the more adequate taxation of commercial highway traffic has been made in the State of Kansas since the enactment of the Port-of-Entry law, which provides for the registry and collection of fees from trucks entering Kansas from bordering states. During the first six months of 1934, the state collected $268,799.76 in motor carrier taxes, compared with $122,339.47 for the first half of 1933, when the law was not in effect. The law has also had a wholesome effect in providing more adequate supervision of the use of the Kansas highways by commercial vehicles from outside the state.

Erie Reduces Accidents at Highway Crossings

In 1933 there were 56 less highway grade crossing accidents on the Erie than in 1932, or 181 in all compared with 237 the previous year. This reduction in accidents, which is proportionately three times as great as that effected by the railroads of the country as a whole, is the result of a consistent campaign embracing several well defined activities. These include more care in the sounding of whistle warnings, systematic inspections to note the conditions at the crossings and an intensive publicity campaign throughout the territory served by the Erie. However, attention has been centered in large part on the physical aspects of the crossings. Smoother and wider crossings have been provided, involving an expenditure of $400,000 in six years. Steps have been taken to remove obstructions to the view of the tracks, and a total of more than $500,000 has been spent for improved crossing protection, the larger part of it for flashing signals conforming to the standards of the American Railway Engineering Association.

Court Sets Value for Los Angeles Terminal Ground

Preparations for the construction of the proposed Los Angeles Union passenger station were carried one step further on August 4, when the Court of Los Angeles set a value of $1,207,069 on land owned by the Southern Pacific, which is to serve as the site for the terminal. The Southern Pacific had contended for a value between $3,473,676 and $4,000,000, while the Union Pacific and the Atchison, Topeka & Santa Fe, which are also to share in the cost of the improvement, estimated the value as between $1,000,000 and $1,324,150.

Faster Time Between Chicago and the Twin Cities

Faster time between Chicago and the Twin Cities for passenger, as well as freight trains, is assured by announcement of plans for stepping up the schedules of the former by the Chicago & North Western, the Chicago, Burlington & Quincy and the Chicago, Milwaukee, St. Paul & Pacific, all of which established 11-hour freight train schedules between these two important railroad centers, on August 6. The route distances for these three roads range from 407 to 431 miles. While plans have not been completed, it is expected that the new passenger train schedules will range from 6½ hours for new streamlined trains recently ordered for this service by the Burlington, to about 9 hours for trains of the usual type of equipment. Present passenger train schedules range from 10 hr. 30 min., to 13 hr. 10 min.

Net Shows Increase for Six Months

Class I railroads for the first six months of 1934 had a net railway operating income of $225,803,916, which was at the annual rate of return of 2.09 per cent on their property investment, as compared with a net of $154,728,928, or 1.42 per cent, in the corresponding period of 1933, according to reports compiled by the Bureau of Railway Economics. Operating revenues for the first six months totaled $1,629,897,100, as compared with $1,415,322,703 for the same period in 1933, an increase of 15.2 per cent. Operating expenses amounted to $1,212,287,063, as against $1,069,051,006 for the same period in 1933, an increase of 13.4 per cent. For June these railroads had a net of 41,836,301, or 1.99 per cent, as compared with a net of 59,831,293, or 2.83 per cent, in June, 1933. Operating revenues were $282,779,492, as compared with $278,329,369, an increase of 1.6 per cent. Operating expenses in June were $208,313,248, as against $185,342,623 in the same month last year, an increase of 12.4 per cent.

Air Express Business Increases

The rapidly increasing popularity of the air express service of the American Express Agency is evidenced by the fact that the number of shipments and the total weight of all shipments during the first half of 1934 were 139 per cent and 150 per cent greater, respectively, than the corresponding number and poundage in the first six months of 1933. Furthermore, an analysis of the shipping totals shows that for 33 consecutive months, the number of shipments handled each month was more than 100 per cent greater than the total for the same month of the previous year.

Foresees More Construction In Canada

More railway lines will be built in Canada, if plans for the unification of the Canadian National and the Canadian Pacific are carried out, is the opinion of E. W. Beatty, chairman and president of the latter road. "We have got to build more railroad," he said. "Mineral development in the far north, extensions of discoveries of arable land in the north—all this means that we will provide such facilities as the logical and legitimate development of these sections of the country demands. I believe that enough money could be saved out of unification to enable this cost to be incurred with little or no borrowing from outside sources."

Special Track Equipment Code Authority

The following members of the Code Authority of the railroad special track equipment manufacturing industry have been approved by the National Recovery Administration: R. L. Gillespie, manager of sales, railroad division, Bethlehem Steel Company, Bethlehem, Pa.; E. H. Baumgarten, secretary and treasurer, Conley Frog & Switch Company, Memphis, Tenn.; Carrol Burton, president, Lorain Steel Company, Johnstown, Pa.; G. R. Lyman, sales manager, Pettibone-Mulliken Company, Chicago; R. S. Hays, president and chairman of the board, Frog, Switch & Manufacturing Company, Carlisle, Pa.; Charles M. Griffith, vice-president, William Wharton Jr. & Company, Easton, Pa., and American Frog & Switch Company, Hamilton, Ohio; O. DeG. Vanderbilt, president, Weir Kilby Corporation, Cincinnati, Ohio; W. Homer Hartz, president, Morden Frog & Crossing Works, Chicago; G. C. Lucas, president and general manager, Cleveland Frog & Crossing Company, Cleveland, Ohio; J. B. Strong, vice-chairman, Racor Pacific Frog & Switch Company, Los Angeles, Calif., and president, Ramapo Ajax Corporation, New York.

Association News

Bridge and Building Association

The Hotel Sherman has been selected as headquarters for the thirty-first annual convention, which will meet in Chicago on October 16-18. The program is rapidly approaching completion. Several of the committees have already completed their reports and transmitted them to Secretary C. A. Lichty, while others are approaching completion. Supplementing these reports, invitations have been extended to several prominent railway officers to address the association during the convention.

The Bridge and Building Supply Men's Association is also planning an exhibit, adjacent to the convention hall, of materials and equipment used in the construction and maintenance of bridges, applications for space being received by John W. Shoop, secretary of the association and manager of railroad sales, the Lehon Company, Oakley avenue near Forty-Fifth street, Chicago. The complete program for the convention will appear in the next issue of *Railway Engineering and Maintenance.*

Roadmasters Association

After an interval of four years, those railway officers concerned primarily with the maintenance of tracks are awaiting with unusual interest the forty-ninth annual convention of the Roadmasters and Maintenance of Way Association, which will be held at the Hotel Stevens, Chicago, on September 18-20. All indications point to a large attendance. The reports of committees are all in hand, while the program will be supplemented by addresses on timely maintenance topics by prominent railway officers. The program is as follows:

(All sessions on Chicago Daylight Saving Time—one hour ahead of Central Standard Time)

Tuesday Morning, Sept. 18

Convention called to order 10:00 a.m.

Invocation by A. M. Clough, past president, supervisor, N. Y. C., Batavia, N. Y.

Opening address by Harry G. Taylor, chairman, Western Association of Railway Executives, Chicago.

Greetings from the American Railway Engineering Association, by J. E. Armstrong, president (assistant chief engineer, Canadian Pacific System), Montreal, Que.

Greetings from the American Railway Bridge and Building Association, by C. S. Heritage, president (bridge engineer, Kansas City Southern), Kansas City, Mo.

Address by President Elmer T. Howson, editor, *Railway Engineering and Maintenance,* Chicago.

Appointment of special committees.

Report of Committee on Spot Versus Group Renewal of Cross-ties, E. H. Piper, chairman; district engineer, maintenance of way, C. B. & Q., Omaha, Neb.

Tuesday Afternoon

(2:00 p.m.)

Address on The Next Goal in Safety, by J. E. Long, president, National Safety Council (superintendent safety, D. & H.), Albany, N. Y.

Report of Committee on Roadbed Embankment Maintenance, J. P. Corcoran, chairman, supervisor, Alton, Bloomington, Ill.

Address on Building a Maintenance Organization, by A. N. Reece, chief engineer, K. C. S., Kansas City, Mo.

Adjournment to visit exhibit of the Track Supply Association.

Wednesday Morning, Sept. 19

(9:30 a.m.)

Report of Committee on the Cleaning of Stone Ballast, L. J. Drumeller, chairman, division engineer, C. & O., Hinton, W. Va.

Address on Meeting Present Day Roadway Requirements, by Earl Stimson, chief engineer maintenance, B. & O., Baltimore, Md.

Report of Committee on The Conservation of Rail, A. A. Johnson, chairman, track engineer, D. L. & W., Hoboken, N. J.

Wednesday Afternoon

(2:00 p.m.)

Address on The Extent to Which a Railway is Warranted in Making Capital Expenditures for Permanent Track Construction to Effect Economies in Repair and Maintenance, by Robert Faries, assistant chief engineer—maintenance, Penna., Philadelphia, Pa.

Question Box—At which questions submitted by members will be presented for discussion from the floor.

Adjournment to visit exhibit of the Track Supply Association.

Thursday Morning, Sept. 20

(9:30 a.m.)

Report of Committee on Highway Crossing Construction, J. J. Davis, chairman, supervisor, E. J. & E., Joliet, Ill.

Business session. Election of officers, selection of 1935 convention city, etc.

Visit Transportation Exhibit and Wings of A Century, A Century of Progress (2:00 p.m.)

Track Supply Association

The hearty response to the invitation to participate in the twentieth annual exhibit, which will be presented at the Hotel Stevens, Chicago, in connection with the convention of the Roadmasters Association, insures a large and instructive display of materials and equipment used in the construction and maintenance of railway tracks. Up to August 27 a total of 38 firms have taken membership, 33 of which will also present exhibits. These are as follows:

Exhibitors

Air Reduction Sales Company.
American Fork & Hoe Company.
The Austin-Western Road Machinery Company.
Chipman Chemical Company, Inc.
Conley Frog & Switch Company.
The Duff-Norton Manufacturing Company.
Eaton Manufacturing Company.
Illinois-Malleable Iron Company.
Ingersoll-Rand Company.
O. F. Jordan Company.
Kelsey Hayes Wheel Co.
Lundie Engineering Corporation.
Maintenance Equipment Company.
Morden Frog & Crossing Works.
The National Lock Washer Company.
Nordberg Manufacturing Company.
The Oxweld Railroad Service Company.
The P & M Company.
Pettibone-Mulliken Company.
The Pocket List of Railroad Officials.
Positive Rail Anchor Company.
The Rail Joint Company.
Railroad Accessories Corporation.
Railway Engineering and Maintenance.
Railway Purchases and Stores.
Railway Track Work Company.
Ramapo Ajax Corporation.
Sellers Manufacturing Company.
Sinclair Refining Company.
Sperry Rail Service.
Templeton, Kenly & Co., Ltd.
White Manufacturing Company.
Woodings-Verona Tool Works.

Non-Exhibitors

American Hoist & Derrick Co.
Electric Tamper & Equipment Company.
Fairmont Railway Motors.
Northwestern Motor Company.
The Ohio Power Shovel Company.

American Railway Engineering Association

The annual proceedings for 1934 are now off the press and in the bindery and will be mailed to the members within the next two weeks. Including inserts, the volume of proceedings will have fully 350 more pages than the proceedings for 1933. A bulletin incorporating the latest revision to the Manual is also ready for early distribution.

Meetings of full committees during the month of August were confined to two—that of the Committee on Rules and Organization, which was held at Buffalo, N. Y., on August 10, with 6 present, and that of the Committee on Water Service and Sanitation, at Chicago, on August 17, attended by 20 members. Seven committees have already scheduled meetings for September, including Buildings at New York on September 6 and 7, Economics of Railway Operation at Cleveland on September 12 and the remaining five at Chicago. These include Economics of Railway Labor on September 7, Masonry on September 13 and 14, Track on September 18 and 19, Roadway about September 18-20, and Highways on September 28.

At the request of the American Railway Association, the Committee on Iron and Steel Structures has been given an additional assignment concerning the maximum live loads to be provided for in the design of highway bridges, with instructions to report promptly.

To the Members of The Roadmasters and Maintenance of Way Association of America and Their Friends

The Woodings-Verona Tool Works and the Woodings Forge and Tool Company are gratified to know that this year brings forth a resumption of your annual convention and the attendant exhibit of the Track Supply Association.

We will be glad to greet you at Booth No. 76 at the Stevens Hotel, Chicago, Illinois, September 18, 19 and 20, 1934.

WOODINGS-VERONA TOOL WORKS
WOODINGS FORGE AND TOOL CO.
VERONA **PENNA.**

Personal Mention

General

E. H. Piper, district engineer maintenance of way of the Chicago, Burlington & Quincy, Lines West of the Missouri River, with headquarters at Omaha, Neb., has been appointed trainmaster on the McCook division, with headquarters at McCook, Neb.

C. C. Cook, maintenance engineer of the Baltimore & Ohio at Baltimore, Md., has been appointed a member of the National Railroad Adjustment Board, which has headquarters at Chicago, to serve as a representative of the eastern roads on Division 3, which has supervision over matters relating to maintenance of way employees and miscellaneous groups. Mr. Cook was born on April 19, 1881, and entered the service of the Baltimore & Ohio engineering department in May, 1900, as an axman. From August, 1901, to July, 1908, he served successively as masonry inspector, levelman and transit man, assistant resident engineer, field engineer and chief draftsman in the engineering department. From the latter year to July, 1911, Mr. Cook held the positions of assistant engineer, maintenance of way and head draftsman, both with headquarters at Cincinnati. He was appointed division engineer at Philadelphia in 1911 and was later transferred to Pittsburgh in the same capacity. In May, 1917, he was appointed district engineer, maintenance of way of the West Virginia district, and in July, 1918, he became manager of the personnel department at Baltimore, being appointed maintenance engineer with headquarters at Baltimore in March, 1919.

C. C. Cook

Engineering

E. L. Potars, assistant engineer on the Chicago, Burlington & Quincy in charge of this company's rail flaw detector car, and formerly a division engineer on this road, has been promoted to district engineer maintenance of way, Lines West of the Missouri River, with headquarters at Omaha, Neb., succeeding **E. H. Piper,** whose transfer to the operating department is noted elsewhere in these columns.

O. E. Williams has been appointed inspecting engineer of track of the Great Northern, with headquarters at St. Paul, Minn., to succeed **Julius H. Goos,** who has retired.

Albert A. Johnson, whose promotion to engineer maintenance of way of the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J., was noted in the August issue, was born at Mansfield, Pa., and was graduated from Lafayette college in 1907. In the same year he entered railway service with the New York Central in the office of the division engineer on the Eastern division, and in 1910 was promoted to assistant supervisor on the same division. In 1916 he was promoted to assistant engineer and in 1918 was transferred to the office of the engineer of tracks, lines east. In 1920 he was promoted to supervisor of track with headquarters at Kingston, N. Y., later being transferred to Albany, N. Y. In 1926 he left the New York Central to become engineer of track with the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J., which position he was holding at the time of his recent promotion to engineer maintenance of way.

J. H. Morgan, track supervisor for the Florida East Coast with headquarters at New Smyrna, Fla., has been appointed acting engineer maintenance of way at St. Augustine, Fla., succeeding **W. G. Brown,** notice of whose death appears elsewhere. Mr. Morgan was born on September 27, 1886, at Alma, Ark., and attended Virginia Military Institute and the University of Virginia. Before entering railroad service he served as a rodman of the General Land Office and topographer on the Muscle Shoals survey under the War Department. In 1912 he entered the service of the St. Louis-San Francisco as transitman, and from 1914 to 1917 Mr. Morgan served as an instrumentman and assistant engineer for the Southern. In the latter year he became assistant engineer for the Jacksonville Terminal on the construction of the new terminal at Jacksonville, returning to the Southern in 1921 as engineer of track work. In 1924 he went to the Florida East Coast as resident engineer, being employed subsequently as roadmaster and track supervisor.

M. H. Doughty, announcement of whose appointment as assistant to chief engineer of the Delaware, Lackawanna & Western, was noted in the August issue, was born in September, 1877 at Maxville Prairie, Wis., and was graduated from the State College of South Dakota with a degree of B. S. in Civil Engineering in 1900. After two years further study in civil engineering at the University of Minnesota, he entered the service of the Lackawanna as a transitman, on March 1, 1902. From that time until 1909 Mr. Doughty held various positions in the engineering department, and in 1910 he was appointed assistant to the chief engineer. In 1912 he was appointed general manager of the Moore Timber Company, Panama City, Fla., a company owned and operated by the Lackawanna, and in 1914 returned to the parent company to become again assistant to the chief engineer, in charge of valuation and other matters assigned. In 1917 he was appointed division engineer at Hoboken and in 1933 was advanced to engineer maintenance of way, the position he held until his recent appointment.

M. H. Doughty

Effective on August 1 the Southern Railway system lines were grouped into Eastern lines, Central lines and Western lines and the present grouping of lines east and lines west, as heretofore constituted for purpose of operation, as well as the Piedmont, Memphis & Charleston, Queen & Crescent, St. Louis-Louisville, and Alabama districts were abolished.

H. E. Tyrell, engineer maintenance of way, on lines west at St. Louis, Mo., has been appointed chief engineer, maintenance of way and structures, Central lines, with office at Knoxville, Tenn. **G. L. Sitton,** chief engineer, maintenance of way and structures, lines east, with headquarters at Charlotte, N. C., has been appointed to a similar position with the Eastern lines. **A. A. Woods,** chief engineer, maintenance of way and structures, lines west, at Cincinnati, Ohio, has been appointed to a similar position with the Western lines, with the same headquarters. **R. D. Tobien,** engineer maintenance of way on the lines west, at Birmingham, Ala., has been appointed assistant to chief engineer, Western lines, with the same headquarters. **G. P. Asbury,** engineer maintenance of way on the lines east, at Danville, Va., has been appointed assistant chief engineer, maintenance of way and structures, Eastern lines, at Charlotte, and **H. C. Libby,** engineer bridges, lines east, at Charlotte, has been appointed to the same position on the Eastern lines, with the same headquarters. **E. Bennett,** engineer maintenance of way on the lines east, at Knoxville, Tenn., has been appointed assistant chief engineer, maintenance of way and structures, Central lines, and **R. Hayes,** assistant engineer of bridges, lines west, at Cincinnati, has been appointed engineer bridges, Central

Main-line Service

TELLS THE STORY

IT's main-line service that shows up switch stands, and that's where Bethlehem Model 53-B comes into its own.

It has simple, rugged construction that assures long, trouble-free service. Powerful action that makes it easy to throw the heavy switches used in modern track. Large base area that provides great stability.

These are features that have won for Bethlehem Model 53-B wide acceptance by representative roads.

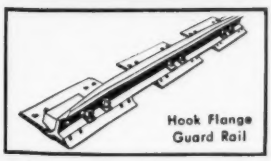
Other Features of Bethlehem Model 53-B Switch Stand

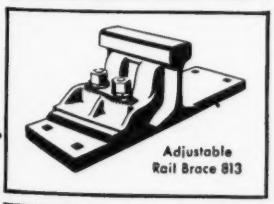
Only three moving parts—This stand is of the gearless type; the only moving parts are the throwing-lever, spindle and sliding block. The sliding block, moved by the crank of the throwing-lever, turns the spindle and throws the switch.

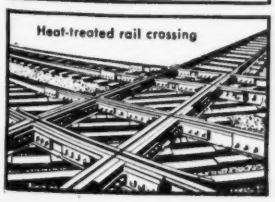
Extra pair of wearing surfaces—Should the sliding block become worn after long service, a quarter turn quickly takes up the slack by bringing two new, full-size wearing surfaces into position. Easy adjustment of the throw is provided by an adjustable screw-up crank.

Safe, easy operation—A weighted throwing-lever, operating parallel to the track, assures the safety of the operator and makes throwing easier. When in normal position the weighted lever is on dead center. Locking-ears, integral with the base, provide for the application of the usual switch lock.

OTHER BETHLEHEM TRACK EQUIPMENT

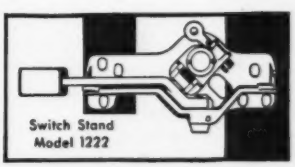


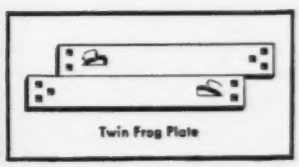




BETHLEHEM STEEL COMPANY
GENERAL OFFICES: BETHLEHEM, PA.

District Offices: Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Milwaukee, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Washington, Wilkes-Barre, York. *Pacific Coast Distributor:* Pacific Coast Steel Corporation, San Francisco, Seattle, Los Angeles, Portland, Honolulu. *Export Distributor:* Bethlehem Steel Export Corporation, New York.





BETHLEHEM *Track Equipment*

lines, with office at Knoxville, Tenn. **O. D. Colaw,** engineer maintenance of way on the lines west, at Chattanooga, Tenn., has been appointed assistant chief engineer maintenance of way and structures, Western lines, at Cincinnati, and **G. H. Gilbert,** engineer bridges, lines west, at Cincinnati, has been appointed to the same position on the Western lines, with the same headquarters.

Track

Foster S. Bowden, assistant supervisor of track on the Pennsylvania, with headquarters at Dennison, Ohio, has been promoted to supervisor of track at Cambridge, Ohio.

John F. Chandler, supervisor on the Pennsylvania, with headquarters in the office of the chief engineer maintenance of way, New York zone, at New York, was retired from active service on July 31, at the age of 70. Mr. Chandler had 53 years active service with the Pennsylvania.

L. B. Craig, assistant supervisor on the St. Louis division of the Southern, has been advanced to track supervisor with headquarters at Princeton, Ind., to take the place of **C. C. Wetzel,** deceased. **F. A. Burroughs,** student apprentice on the Birmingham division, has been transferred to the St. Louis division, succeeding Mr. Craig.

J. A. Loughran, whose promotion to roadmaster on the Canadian Pacific was noted in the August issue, was born on January 9, 1889, at Belfast, Ireland, and after migrating to Canada, entered the service of the Canadian Pacific as a track man on February 26, 1912. Four years later he was advanced to section foreman at Harrowby, Man., and in May, 1917, he was promoted to yard foreman at Bredenburg, where he remained until March 31, 1934, when he was transferred to the Minnedosa yard. During the last five years he has also served as relief roadmaster on the Brandon division, until his recent advancement to the position of roadmaster at Virden, Man.

Bridge and Building

R. C. Mathis, whose recent promotion to system bridge inspector on the Illinois Central, with headquarters at Memphis, Tenn., was noted in the August issue, was born at Kosciusko, Miss., on March 21, 1889, and entered the employ of the Illinois Central on February 27, 1905, as a carpenter in a framing gang. In January 8, 1908, he was promoted to assistant bridge and building foreman, and 17 months later he was further advanced to foreman. He held this position until March 3, 1925, when he was promoted to acting supervisor of bridges and buildings of the Vicksburg division, with headquarters at Vicksburg, Miss., being permanently assigned to that position on June 1 of the same year. He continued to serve in that capacity until his recent promotion.

Obituary

John J. Nolan, announcement of whose death on July 12 appeared in the August issue, was born near Dublin, Ireland, on August 26, 1869. After coming to the United States, he entered the service of the Illinois Central at Remsen, Iowa, in 1882, and after being employed as a water boy and a laborer on that road until 1886, he was hired as a track laborer on the Chicago & Alton at Shipman, Ill. A year later he was advanced to track foreman, which position he occupied at various places on that road until 1898, when he became a track foreman on the Grand Trunk Western at Detroit, Mich. From 1900 to 1933, he was employed in succession as acting roadmaster, general foreman, roadmaster and supervisor of track, being located at Valparaiso, Ind., when he was retired under the pension rules of the railroad on July 31, 1933.

W. G. Brown, engineer maintenance of way of the Florida East Coast, with headquarters at St. Augustine, Fla., died on July 14 in Johns Hopkins University Hospital, Baltimore, Md., as the result of complications arising from a heart disorder. Mr. Brown was a graduate of the University of the South. He entered the service of the Louisville & Nashville about 1897 as an assistant engineer at Montgomery, Ala., and was subsequently promoted to roadmaster, being located for a number of years at Bay St. Louis, Miss. On November 30, 1912, he left railway service to engage in building construction at Birmingham, Ala., and in 1921 he was appointed engineer maintenance of way of the Florida East Coast, the position he occupied at the time of his death. He was about 62 years of age.

Pneumatic Tools—In an eight-page bulletin, No. 2037-A, entitled, "The World's Most Popular Pneumatic Tools" the Ingersoll-Rand Company, New York City, illustrates and gives size and capacity tables for I-R pneumatic drills, grinders, riveters, chippers, rammers, wrenches, hoists, etc. The bulletin also lists for the first time the company's new sizes of Multi-Vane drills, push throttle screw drivers and nut setters.

Structural Metal Painting—The National Lead Company, New York, has issued a thorough treatise on structural metal painting, which is included in a small size booklet of 160 pages. This booklet, of which A. H. Sabin and F. M. Hartley, Jr., are co-authors, discusses the subject in an inclusive manner under 219 headings, which are indexed for the convenience of the user. Since the booklet goes far beyond the actual application of protective coatings and deals with such subjects as the theories of corrosion, conditions affecting paint life, the science of paint, paint formulation, facts about painting materials, testing, judging the value of paints, estimated areas and cost, formulas, etc., it should be informative and helpful to those who specify and order painting materials, as well as to those who actually do the work of applying the materials.

Supply Trade News

Personal

H. C. Youngs, tie and timber agent of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, has resigned to become president of the **Indiana Wood Preserving Company,** Terre Haute, Ind., to succeed Joseph B. Card, who died June 10.

M. J. Czarniecki has been elected vice-president in charge of sales of the **A. M. Byers Company,** Pittsburgh, Pa., succeeding **H. W. Rinearson,** who has resigned. Mr. Czarniecki entered the service of the Byers Company in 1913 as a member of its sales organization. The following year he was assigned to the New York

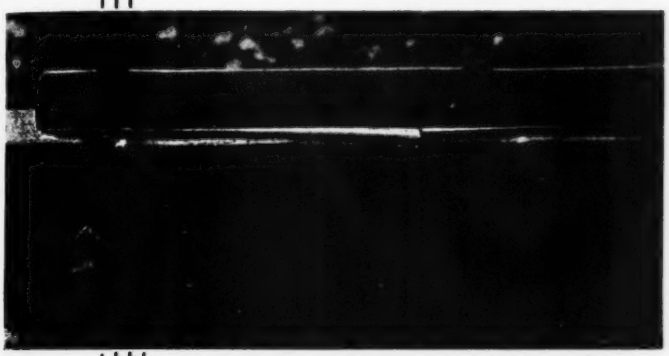
M. J. Czarniecki

office, where he remained until his transfer to Chicago in 1915. After the war, in 1918, he returned to Chicago as district manager and the following year was transferred as district manager to New York, serving in that capacity until 1925 when he was appointed assistant general manager of sales with headquarters at Pittsburgh, Pa. In September, 1930, Mr. Czarniecki was appointed to the newly-created position of manager of tubular sales, and subsequently he was appointed general manager of sales of the same company, which position he held at the time of his recent appointment.

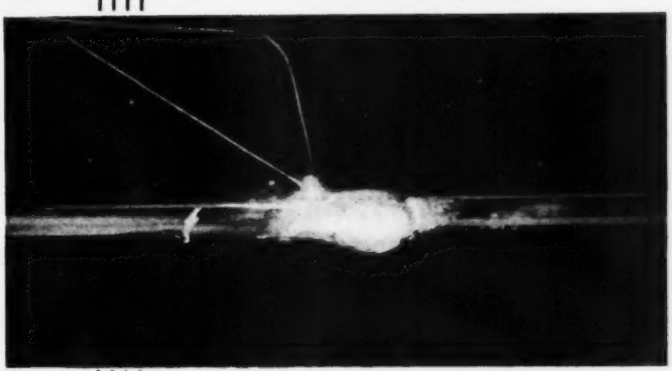
The American Lumber & Treating Corporation, Chicago, has been reorganized as the **American Lumber & Treating Company,** a new corporation, in which the Aluminum Company of America and the Chicago Bridge & Iron Works have acquired interests. The object of this reorganization is to expand the program for the preservative treatment of wood with Wolman salts. **R. M. Morris,** president of the old company, has been elected president of the new company. **J. P. Linthicom,** vice-president of the Aluminum Company of America, has been elected vice-president and treasurer, and **J. C. Vorberg,** district sales manager of the Chicago Bridge & Iron Works, becomes assistant treasurer of the new company.

AIRCOWELDING

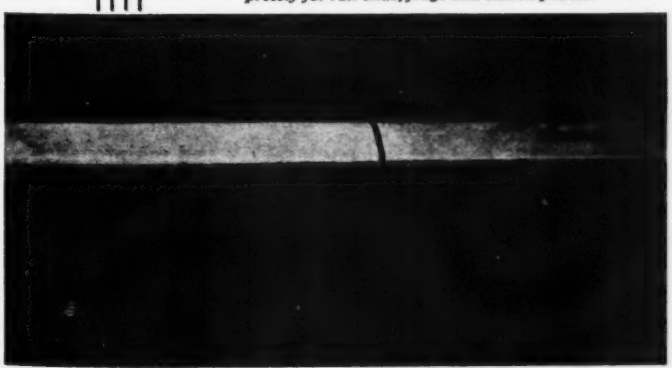
the most economical way to build up rail ends



Straight edge shows the amount of building-up required on these battered rail ends.



AIRCOWELDING in progress. Best results are assured by the use of AIRCO-DB R. R. ROD, which was developed expressly for rail ends, frogs and switch points.



Completed rail ends, good as new. If they are now heat treated, they will last as long as the rails and will not have to be built up again.

AIRCOWELDING is a simpler, faster oxyacetylene welding process. It was originated by AIRCO Research Laboratories and its application to pipe welding was first perfected. It has revolutionized the welding of pipe *by cutting welding time in half and reducing gas consumption from 40 to 50 percent.* This stands definitely proved by widespread usage in oil and gas pipe line construction and in piping installations in buildings of all kinds.

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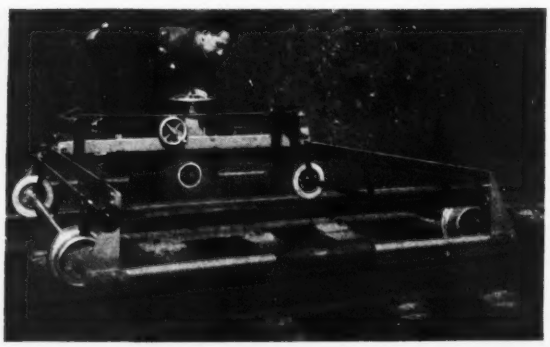

MODEL P. 21
PORTABLE TRACK GRINDER

Railway Track-work Co.

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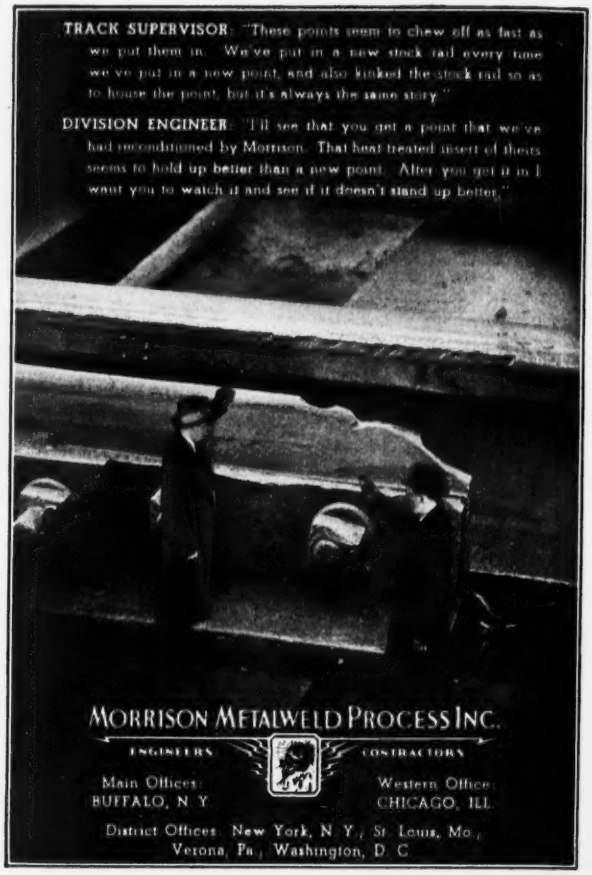
TRACK SUPERVISOR: "These points seem to chew off as fast as we put them in. We've put in a new stock rail every time we've put in a new point, and also kinked the stock rail so as to house the point, but it's always the same story."
DIVISION ENGINEER: "I'll see that you get a point that we've had reconditioned by Morrison. That heat treated insert of theirs seems to hold up better than a new point. After you get it in I want you to watch it and see if it doesn't stand up better."
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This list describes books on railway engineering, track work, building construction, bridge engineering, concrete, welding, water service, etc. Sources of information on various branches of engineering and maintenance work are also listed. The list contains 18 pages mimeographed on 8½ x 11 inch sheets and is worth filing for handy reference when book information is needed.

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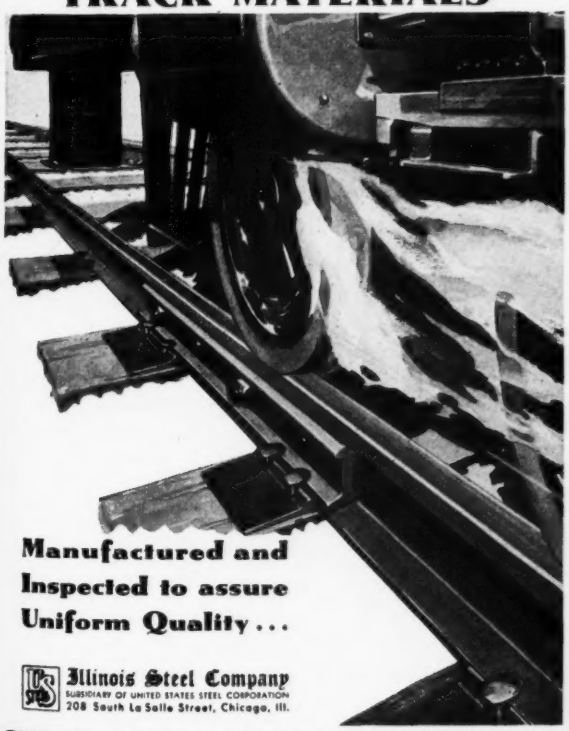

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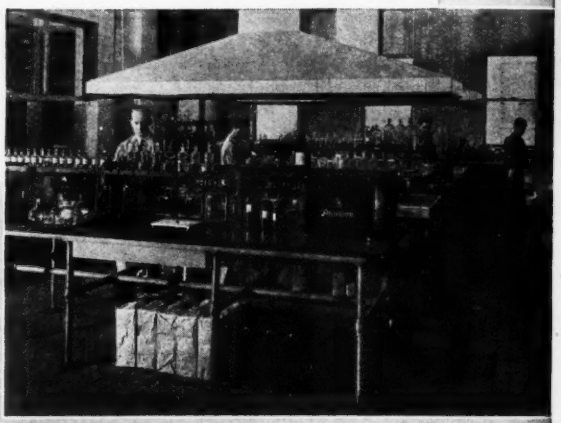

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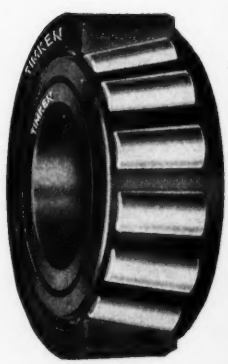

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